SESSIONAL PAPERS.

VOL. XXVI.—PART VI.

FOURTH SESSION, SEVENTH LEGISLATURE

OF THE

PROVINCE OF ONTARIO.

SESSION 1894.

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LIST OF SESSIONAL PAPERS

ARRANGED ALPHABETICALLY.

TITLE.	No.	REMARKS.
Accounts, Public	1	*Printed.*
Agricultural and Arts Board, grant to	113	*Not printed.*
Agricultural and Arts, Report	39	*Printed.*
Agricultural College, Report	32	"
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do Cattle sale at	95	*Printed.*
do do names of cattle	97	*Not printed.*
Agricultural Societies, Analysis	103	"
Algonquin Park, Reports	22	*Printed.*
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Asylums, Report	26	*Printed.*
Awrey, N., Report on Chicago Exposition	98	"
Bee-Keepers' Association, Report	38	*Printed.*
Binder twine industry	80	"
Births, Marriages and Deaths, Report	11	"
Blind Institute, Report	30	"
Bonds and Securities	69	*Not printed.*
Bryce, charges against	127	"
Canadian Institute, Report	10	*Printed.*
Central Farmers' Institute, Report	36	"
Census Returns, Provincial	104	"
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Children Neglected, Report	47	"
City and County Clerks, salaries	109	"
City and County Treasurers, salaries	108	"
Colonization Roads in Smith	83	*Not printed.*
Columbian Exposition, Report	98	*Printed.*
do Stockmen's payment	89	*Not printed.*
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County Councils, Reeves comprising in 1887 and 1892..	55	*Printed.*
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Dairymen and Creameries, Report	34	*Printed.*
Davidson liquor license	91	*Not printed.*
Deaf and Dumb Institute, Report	31	*Printed.*
Disputed Territory, number of acres sold in, etc.... ...	119	"
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do Rules, etc	118	*Not printed.*
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Dorian charges against P. H. Bryce.....	127	*Not printed.*
Dufferin Registrar, fees for 1893	90	"
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Education, Report	3	"
do Report of Commissioners in Prescott	4	"
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Elgin License Commissioners.....	86	*Printed.*
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Estimates	2	"
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Farmers' Institutes, Report	36	"
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Fish and Game, Report	17	"
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French language in Prescott and Russell.....	4	*Printed.*
Fruit-Growers' Association, Report	37	"
Game and Fish, Report	17	*Printed.*
Game Laws, correspondence	63	*Not printed.*
Gaols, Prisons and Reformatories, Report	27	*Printed.*
Goderich Police Magistrate.....	126	*Not printed.*
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Hamilton Beach lease	82	*Not printed.*
Hamilton, working of license law	78	*Printed.*
Hastings, Grand Jury Indictments in	60	*Not printed.*
Health Report	12	*Printed.*
Hospitals, Report	29	"
Immigration, Report	15	*Printed.*
Industries, Bureau of, Report	44	"
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Insurance, Report	13	*Printed.*
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Maguire, F., appointment	120	*Not printed*
Maton inquest	110	"
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Queen Victoria Niagara Falls Park, Report	23	*Printed.*
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Secretary and Registrar, Report	18	*Printed.*
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No. 1.. Public Accounts of the Province for the year 1893. Presented to the Legislature, 27th February, 1894. *Printed.*

No. 2.. Estimates for the service of the Province until the Estimates of the year are finally passed. Presented to the Legislature, 16th February, 1894. *Not printed.* Estimates for the year 1894. Presented to the Legislature, 28th February, 1894. *Printed.* Estimates required for the service of the Province until the Estimates for the year are finally passed. Presented to the Legislature, 3rd April, 1894. *Not printed.* Estimates (Supplementary) for the year 1894. Presented to the Legislature, 27th April and 1st May, 1894. *Printed.*

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No. 3.. Report of the Minister of Education for the year 1893, with the statistics of 1892. Presented to the Legislature, 6th March, 1894. *Printed.*

No. 4.. Report of the Commissioners on Schools in the Counties of Prescott and Russell, in which the French language is taught, Presented to the Legislature, 16th February, 1894. *Printed.*

No. 5.. Report of the Upper Canada College for the year ending 30th June, 1893. Presented to the Legislature, 19th February, 1894. *Printed.*

No. 6.. Return to an Order of the House of the first day of April, 1892, for a Return shewing the number of Royal Commissions issued since Confederation, together with the date of the issue thereof, subjects inquired into, costs of each with names of Commissioners and amounts paid to each. Presented to the Legislature, 23rd February, 1894. Mr. *Marter.* *Printed.*

No. 7.. Report of the Toronto University for the year 1892-93. Presented to the Legislature, 16th February, 1894. *Not printed.*

No. 8.. Report of the Standing Committee on Finance, of the Toronto University, on the income and expenditure, 1893-94, of the Medical Faculty. Presented to the Legislature, 16th February, 1894. *Printed.*

No. 9.. Report of the Standing Committee of the University of Toronto, on Finance, for the year 1893-94. Presented to the Legislature, 16th February, 1894. *Printed.*

No. 10.. Report of the Canadian Institute for the year 1893. Presented to the Legislature, 3rd April, 1894. *Printed.*

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No. 12.. Report of the Provincial Board of Health for the year 1893. Presented to the Legislature, 24th April, 1894. *Printed.*

No. 13.. Report of the Inspector of Insurance and Registrar of Friendly Societies for the year 1893. Presented to the Legislature, 16th February, 1894. *Printed.*

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No. 15.. Report of the Department of Immigration for the year 1893. Presented to the Legislature, 15th March, 1894. *Printed.*

No. 16.. Report of the Inspector of Division Courts for the year 1893. Presented to the Legislature, 5th March, 1894. *Printed.*

No. 17.. Report of the Ontario Fish and Game Commission for the year 1893. Presented to the Legislature, 5th March, 1894. *Printed.*

No. 18.. Report of the Secretary and Registrar of the Province, for the year 1893. Presented to the Legislature, 19th April, 1894. *Printed.*

No. 19.. Report on the working of the Tavern and Shop License Acts, for the year 1893. Presented to the Legislature, 16th February, 1894. *Printed.*

No. 20.. Report of the Commissioner of Public Works for the year 1893. Presented to the Legislature, 7th March, 1894. *Printed.*

No. 21.. Report of the Bureau of Mines. Presented to the Legislature, 27th April, 1894. *Printed.*

No. 22.. Reports on the Algonquin National Park of Ontario, for the year 1893. Presented to the Legislature, 27th April, 1894. *Printed.*

No. 23.. Report of the Commissioners of the Queen Victoria Niagara Falls Park, for the year 1893. Presented to the Legislature, 26th March, 1894, *Printed.*

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No. 37.. Report of the Fruit-Growers' Association of Ontario, for the year 1893. Presented to the Legislature, 20th April, 1894. *Printed.*

No. 38.. Report of the Bee-Keepers' Association of Ontario, for the year 1893. Presented to the Legislature, 14th March, 1894. *Printed.*

No. 39.. Report of the Agriculture and Arts Association, for the year 1893. Presented to the Legislature, 2nd March, 1894. *Printed.*

No. 40.. Report of the Poultry Association of Ontario, for the year 1893. Presented to the Legislature, 2nd March, 1894. *Printed.*

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No. 41.. Report of the Sheep and Swine Breeders' Association of Ontario, for the year 1893. Presented to the Legislature, 17th April, 1894. *Printed.*

No. 42 .. Report of the Inspectors of Factories for the year 1893. Presented to the Legislature, 19th March, 1894. *Printed.*

No. 43 .. Return to Orders of the House of the tenth day of April and nineteenth day of May, 1893, and of the twenty-sixth day of February, 1894, respectively, for a Return of the names of all persons who, during the year 1871, held office under the Crown or were employed in, or in connection with any Department or branch of the Public Service, to whom or in respect of whose office or employment any salary or remuneration was paid out of the Consolidated Revenue Fund, or any special Fund applicable for the purpose, or by fees or otherwise, and whether the office or employment was permanent or temporary, together with a statement of the salary or remuneration attached to or payable in respect of each such office or employment, and the amount paid in the said year to each of such persons, and the date when each permanent office was created, and for a like Return for the year 1892 ; the several branches of the Public Services to which such Return relates to be classified therein as nearly as practicable as the same are classified in the Public Accounts. And a Return shewing in addition to, and as part of the Return, relating to the Public Service, ordered by the House on the tenth day of April last, the number of the letters written from each of the Departments of the Government of the Province during the years 1871 and 1892 respectively, relating exclusively to the Public Service, and distinguishing, as far as practicable, those written by the different branches of each Department. And giving also a statement from each of the Departments shewing comparatively the volume of business done in each Department during the said years 1871 and 1892, such statement to classify, so far as practicable, the business under general heads, and to set out the causes of increase or decrease under each head, and to specify the branches of the Public Service and the additions thereto, which have come into existence since the year 1871. And a Return shewing in addition to the information for the years 1871 and 1892, like information for the year 1873. Presented to the Legislature, 3rd April, 1894. Messieurs *Meredith*, *Davis* and *Balfour*. *Printed.*

No. 44 .. Report of the Bureau of Industries for the Province, for the year 1893. Presented to the Legislature, 17th April, 1894. *Printed.*

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No. 52 .. Return to an Address to His Honour the Lieutenant-Governor, of the twenty-eighth day of April, 1893, praying that he will cause to be laid before the House a Return, shewing as to what offices, or services, Orders in Council have been passed commuting the fees; the date of the Orders in Council; the amount of the commutation allowances, with a schedule or table shewing the amounts paid to each official in each year since the Order in Council was passed, and the amount received by the Province in each year from the fees of his office. Presented to the Legislature, 16th February, 1894. Mr. *Hudson*. *Printed*.

No. 53 .. Supplementary Return to an Order of the House of the eleventh day of April, 1892, for a Return shewing by townships the amount remaining unpaid on the 31st December last on lands sold, of (1) Crown Lands, (2) Common School Lands, (3) Grammar School Lands, (4) Railway Lands, and the aggregate amount due in respect of each of the said classes of lands distinguishing the amounts due for principal and interest respectively. Presented to the Legislature, 16th February, 1894. Mr. *Meredith*. *Printed*.

No. 54 .. Return to an Order of the House of the twenty-eighth day of April, 1893, for a Return shewing the number and names of places visited in the different electoral constituencies in the Province in each of the years 1891 and 1892 by the Travelling Dairy, the number of persons forming the staff of each Dairy, the salaries paid, the travelling and other expenses incurred, and the manner in which these travelling expenses were paid. Presented to the Legislature, 16th February, 1894. Mr. *Preston*. *Not printed*.

No. 55 .. Return to an Order of the House of the fifth day of May, 1893, for a Return shewing the numbers of Reeves comprising the various County Councils of the Province in the years 1887 and 1892 respectively, together with the statement of the amount paid as indemnity and the assessment of each of the said Municipalities in each of the above mentioned years. Presented to the Legislature, 16th February, 1894. Mr. *Wood (Brant)*. *Printed*.

No. 56 .. Return to an Order of the House of the twelfth day of May, 1893, for a Return shewing as to the conditions of policies ordinarily used by fire Insurance Companies in Ontario. Firstly—Companies using policies without conditions, or with conditions less than the statutory ones. Secondly—Those using statutory conditions only. Thirdly—Those imposing additional conditions to the statutory conditions, and the nature of such conditions. Presented to the Legislature, 16th February, 1894. Mr. *Monk*. *Not printed*,

No. 57 .. Return to an Order of the House of the seventeenth day of May, 1893, for a Return shewing the number of resignations, dismissals and suspensions of License Commissioners and Inspectors for the years 1890-91 and '92. Also, copies of all papers and correspondence connected therewith, and instructions to special Agents, and names of Commissioners and Inspectors so dismissed or suspended, or who have resigned, and the causes of such resignation, dismissal or suspension. Presented to the Legislature, 16th February, 1894. Mr. *Ryerson*. *Printed*.

No. 58 .. Return to an Order of the House of the nineteenth day of May, 1893, for a Return, so far as the facts appear from the papers filed, and the books in the office at Osgoode Hall, relating to the motions and other matters heard and disposed of from first day of November, 1892, to first day of May, 1893, by or before a Judge of the High Court, sitting in Court at Osgoode Hall, in the Chancery Division, and in the Queen's Bench and Common Pleas Divisions of the High Court respectively—exclusive of trials at sittings for trials. Such Return to shew and classify as far as practicable under general heads the nature of the various motions and proceedings in Single Court. Also, shewing which of them were unopposed and which of them were disposed of upon consent of parties. Also, shewing the style in short form, of the several actions, causes and matters, and in what counties the same respectively originated. Presented to the Legislature, 16th February, 1894. Mr. *Guthrie*. *Printed.*

No. 59 .. Return to an Order of the House of the nineteenth day of May, 1893, for a Return of a copy of the application for and Petition against the granting of a Tavern or other liquor license to Mr. Scott, of the City of Windsor, together with copies of all correspondence, minutes, proceedings and papers relating thereto. Presented to the Legislature, 16th February, 1894. Mr. *White*. *Not printed.*

No. 60 .. Return to an Order of the House of the nineteenth day of May, 1893, for a Return shewing how many indictments have been placed before the Grand Jury in the County of Hastings for the last six years; in how many cases were true Bills found; how many cases were there in which the parties charged were in the County at the time of preferring the indictments; in how many cases have the persons charged been brought back under extradition or otherwise, and what has been the cost to the County of Hastings. Presented to the Legislature, 16th February, 1894. Mr. *Hudson*. *Not printed.*

No. 61 .. Return to an Order of the House of the twelfth day of May, 1893, for a Return shewing as to the names of Life Insurance Companies doing business in Ontario among the industrial classes and receiving premiums of one dollar or under, weekly, and shewing an unusual condition in the policies. Shewing also, the number and names, so far as ascertainable, of cases disputed or contested by such companies during the last two years and the amount involved. And the defences set up to such cases. Presented to the Legislature, 16th February, 1894. Mr. *Monk*. *Printed.*

No. 62 .. Return to an Order of the House of the eleventh day of March, 1892, for a Return shewing, in monthly form, the Expenditure in the Public Institutions of the Province from the year 1883 to the year 1891, both inclusive. Presented to the Legislature, 22nd February, 1894. Mr. *H. E. Clarke, (Toronto)*. *Printed.*

No. 63 .. Return to an Order of the House of the twenty-eighth day of April, 1893, for a Return of copies of all correspondence between any

member of the Government and any other person or persons respecting prosecutions under the Game Laws in the Counties of Lennox and Addington, and for copies of returns of all convictions for offences under the Game Laws in said Counties since the 1st July, 1892. Presented to the Legislature, 22nd February, 1894. Mr. *Reid.* *Not printed.*

No. 64 .. Return to an Order of the House of the twelfth day of April, 1893, for a Return shewing the amount due in the year 1889, by Alexander McLaren, for dues on timber cut on the berth in the Township of Wilberforce, of which he was licensee and of the amount accepted in payment of his indebtedness and of copies of all correspondence with reference to such indebtedness, and the settlement of it and of all reports by an officer of the Department in reference thereto, and as to the quantity of timber cut by the licensee and as to the value of the license. Presented to the Legislature, 23rd February, 1894. Mr. *Miscampbell.* *Not printed.*

No. 65 .. Report of the Inspector of Registry Offices for the year 1893, together with a statement of the Returns of the Fees and Emoluments of the Registrars of Ontario for the same year. Presented to the Legislature, 26th February, 1894. *Printed.*

No. 66 .. Copy of an Order in Council approving of an Agreement with the Methodist Book Room and Publishing House, Toronto, respecting the publication of the Public School Text Book on Physiology and Temperance. Presented to the Legislature, 26th February, 1894 *Not printed.*

No. 67 .. Copy of a Minute of the Department of Education approving of certain Regulations of the Department. Presented to the Legislature, 26th February, 1894. *Not printed.*

No. 68.. Copy of an Order in Council appointing Samuel B. Sinclair, B.A,, Vice-Principal of the Provincial Normal School at Ottawa. Presented to the Legislature, 26th February, 1894. *Not printed.*

No. 69.. Detailed Statement of all Bonds and Securities recorded in the Provincial Registrar's Office since the last Return submitted to the Legislature, and made in accordance with the provisions of R.S.O., Cap. 15, Sec. 23. Presented to the Legislature, 26th February, 1894. *Not printed.*

No. 70.. Return to an Order of the House of the twenty-seventh day of February, 1894, for a Return, from the Records of the Votes cast "yes" and "no" on the question of Prohibition on 1st January last under 56 Vict. Cap. 41, showing (1) The number of male votes polled in each Municipality; (2) The number of female votes so polled; (3) The total votes cast; (4) The male and female and total majorities; (5) The number of males and females voting; (6) The number of male and female votes on voters' lists, and number of such votes unpolled; (7) The number of spoiled and rejected ballots; and a further Return showing in detail; (8) The male votes cast in each

electoral district of the Province; (9) The majorities "yes" and "no" in each such electoral district, and the total numbers of male votes cast; (10) The total male votes on voters' lists and unpolled, and (11) A statement of votes polled at the general election for the Legislative Assembly in 1890, with the total votes on voters' lists and unpolled at such election. Presented to the Legislature, 28th February, 1894. Mr. *McKay* (*Oxford.*) *Printed.*

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No. 79.. Return to an Order of the House of the twenty-third day of February, 1894, for a Return of copies of all correspondence and reports with regard to the application or claim of Samuel Spicknell, formerly an employee in the Insane Asylum at London, for a gratuity or allowance, on his ceasing to be employed in the Public Service of the Province. Presented to the Legislature, 19th March, 1894. Mr. *Meredith*. *Not printed.*

No. 80.. Return to an Order of the House of the seventh day of March, 1894, for a Return shewing the amounts expended in connection with the Provincial binder twine industry, (1) for buildings, (2) for machinery, (3) for materials, up to 30th September, 1893, (4) for labour and superintendence, with the names of foreman or superintendents employed and the wages or salary paid to each of them up to 30th September, 1893; and showing also, (1) the total output of twine in quantity and the amounts realized therefrom, giving the names from whom the same were received and the dates of the receipt of each sum prior to 30th September, 1893; (2) the total quantity of twine on hand; (3) the total quantity of material on hand on 30th September, 1893; (4) the amounts (if any) remaining unpaid by the purchasers, with names of the persons by whom the same are payable; (5) the names of the agents employed for the sale or disposal of the twine, and the remuneration paid or payable to each of them; (6) and a statement of the number of prisoners employed in connection with the industry and of the time during which they were employed. Presented to the Legislature, 28th March, 1894. Mr. *Preston*. *Printed.*

No. 81.. Return to an Order of the House of the twenty-eighth day of February, 1894, for a Return of copies of all correspondence in connection with an application for a supply of timber for a local saw mill in the Township of Tyendenaga, in the County of Hastings, by Mr. Fraser Chisholm, of the said township. Presented to the Legislature, 29th March, 1894. Mr. *Wood* (*Hastings.*) *Not printed.*

No. 82.. Return to an Order of the House of the twelfth day of March, 1894, for a Return shewing to whom the Island at Hamilton Beach is leased; the terms of the lease; the amount of annual rental; how the lease was obtained, whether by public auction or private arrangement. Presented to the Legislature, 29th March, 1894. Mr. *Ryerson*. *Not printed.*

No. 83.. Return to an Order of the House of the fourteenth day of March, 1894, for a Return of all moneys paid by the Government for Colonization Roads in the Township of Smith, in the County of Peterborough for the years 1890-91-92-93. Presented to the Legislature, 29th March, 1894. Mr. *Willoughby*. *Not printed.*

No. 84.. Return to an Order of the House of the nineteenth day of March, 1894, for a Return of all convictions under the Liquor License Act in the Riding of North Ontario during the year 1893. Also, shewing all moneys paid to the License Inspector for salary and expenses during the same year, distinguishing the amounts paid for salary and the

amounts paid for expenses Also, of the particulars of any fines which may have been remitted during the same year. Also, the gross amount of money received by the Inspector, in his official capacity, during the same year, and a detailed statement of the amounts disbursed by him during the same time, shewing to whom and for what purposes they were paid. Presented to the Legislature, 29th March, 1894. Mr. *Glendinning.* *Not printed.*

No. 85.. Return to an Order of the House of the seventh day of March, 1894, for a Return of the number of Reeves and Deputy-Reeves comprising the several County Councils of the Province for the year 1893. Presented to the Legislature, 12th April, 1894. Mr. *McKechnie.* *Printed.*

No. 86.. Return to an Order of the House of the twenty-eighth day of March 1894, for a Return giving a copy of the Report of Mr. Stewart, Provincial License Inspector, as to the charge that certain License Commissioners in the County of Elgin were owners of licensed premises, and that licenses were refused certain parties on political grounds. Presented to the Legislature, 2nd April, 1894. Mr. *McColl.* *Printed.*

No. 87.. Return to an Order of the House of the twenty-first day of March last for a Return of copies of all correspondence, commission report and all other documents and papers relating to certain charges made by Robert McDonald against Detective Thomas McKee, of the City of Windsor, and of the disposition of the matter. Presented to the Legislature, 2nd April, 1894. Mr. *White.* *Not printed.*

No. 88.. Copy of the Commission issued to the Honourable T. A. Boyd and others to enquire into and to collect and report to the Lieutenant-Governor upon the facts bearing on the various views which have been expressed with respect to the mode of remunerating and appointing certain Provincial Officials, now paid by fees, including the practice and experience of other countries Presented to the Legislature, 5th April, 1894. *Printed.*

No. 89.. Return to an Order of the House of the twenty-eighth day of March, 1894, for a Return shewing what system of payment the Government adopted in dealing with stockmen at the Columbian Exposition. The amount each owner received for fares, maintenance, caretaking or for any other purpose, distinguishing each amount and giving the name of each owner. Presented to the Legislature, 5th April, 1894. Mr. *McKay* (*Victoria.*) *Not printed.*

No. 90.. Return to an Order of the House of the thirtieth day of March last, for a Return of a detailed statement for 1893 of all fees and emoluments of the Registrars of Deeds for the County of Dufferin in connection with his office. Presented to the Legislature, 5th April, 1894. Mr. *Barr* (*Dufferin.*) *Not printed.*

No. 91... Return to an Order of the House of the fourteenth day of March, 1894, for a Return of copies of all correspondence between Mrs. M. H. M.

Davidson and the Government, or any officer thereof, relating to her application for a license in the years 1892 and 1893, for the Albion Hotel, in the Village of Shannonville. Presented to the Legislature, 6th April, 1894. Mr. *Hudson.* *Not printed.*

No. 92 .. Return to an Order of the House of the twenty-sixth day of March, 1894, for a Return shewing amount collected on account of the Municipal Loan Fund from Confederation until 31st December, 1871. Also, collections on account of Crown, Clergy, Common School, Grammar and Mining Lands in the same period, and collections on same lands in the four years ending 31st December, 1893. Shewing, also, collections on account of Municipal Loan Fund in 1872. Presented to the Legislature, 11th April, 1894. Mr. *Gibson* (*Huron.*) *Printed.*

No. 93 .. Return to an Order of the House of the thirtieth day of March, 1894, for a Return of all convictions under the Liquor License Act in the County of Dufferin during the years 1892 and 1893. Also, of all moneys paid to the License Inspector for salary and expenses, giving the amount paid for salary and expenses separately Also, the particulars of all fines that may have been remitted. Also, the gross amount of money received by the Inspector during the said term, and a detailed statement of the amounts disbursed by him during the said time, shewing to whom and for what such disbursements were made. Presented to the Legislature, 12th April, 1894. Mr. *Barr* (*Dufferin.*) *Not printed.*

No. 94 .. Return to an Order of the House of the fourth day of April 1894, for a Return of copies of all correspondence between the Council of the County of Elgin and the Government with regard to an increased grant to the County, under the provisions of the Act respecting the establishment of Houses of Industry. Presented to the Legislature, 12th April, 1894. Mr. *McColl.* *Not printed.*

No. 95 .. Return to an Order of the House of the first day of March, 1894, for a Return shewing (1) the advertisements for the sale of the cattle offered for sale at the Agricultural College in December last: (2) the conditions of sale; (3) a list of the names of the purchasers and the prices paid for the animals sold; (4) a list of the animals of which the purchasers refused to complete the sale; (5) a statement of the animals sold and afterwards returned; (6) a list of the animals in respect of which the test for tuberculosis was applied, and statement of the result in each case. Presented to the Legislature, 13th April, 1894. Mr. *McColl.* *Printed.*

No. 96 .. Return to an Order of the House of the ninth day of March, 1894, for a Return giving an itemized statement of all expenditures and disbursements in connection with East Northumberland Registry Office for the years 1891, 1892 and 1893, shewing the number of employees, the name of each employee and the period in each year during which he or she was employed. Presented to the Legislature, 13th April, 1894. Mr. *Willoughby.* *Printed.*

No. 97 .. Return to an Order of the House of the twenty-first day of March last for a Return giving the name of the Dam of each Calf offered for sale from the Ontario Experimental Farm and Dairy in the year 1893, and where such Dam was purchased. Presented to the Legislature, 13th April, 1894. Mr. *Ryerson*. *Not printed.*

No. 98 .. Report of N. Awrey, Esquire, M.P.P., as Ontario Commissioner to the World's Columbian Exposition, 1893. Presented to the Legislature, 17th April, 1894. *Printed.*

No. 99 .. Return to an Order of the House of the twenty-sixth day of February, 1894, for a Return shewing the number of persons employed, temporarily or permanently, by the Government in the service of the Province on the 31st December, 1893, together with their names, ages, nationality, religion, salary, occupation, place of residence and date of appointment; but not including mechanics, artisans, laborers or like employees whose engagement or employment was of a merely temporary character. Also, a similar Return as to all Sessional Clerks employed during the Sessions of 1893 and 1894. Presented to the Legislature, 17th April, 1894. Mr. *Balfour*. *Printed.*

No. 100.. Return to an Order of the House of the sixteenth day of March, 1894, for a Return shewing the gross fees or emoluments of each Division Court Clerk and Bailiff in the Province for the year 1893; the net emoluments of such clerks as have paid any sum to the Provincial Treasurer in pursuance of Chapter 17, 55 Victoria, intituled, "An Act respecting the Fees of certain Public Officers." Also, the several amounts paid, or to be paid, under the provisions of the Division Courts Act, to the Provincial Treasurer in each year for the ten years ending on the 31st December, 1893. Presented to the Legislature, 17th April, 1894. Mr. *Marter*. *Printed.*

No. 101 .. Return to an Order of the House of the sixteenth day of March, 1894, for a Return giving a detailed statement of the receipts and expenditures of the Law Society of Ontario for the year 1893. Also, a statement of the assets and liabilities of the Society on the first day of January, 1894. Also, a statement shewing the objects and purposes to which the funds of the Society are applicable. Presented to the Legislature, 17th April, 1894. Mr. *Balfour*. *Printed.*

No. 102 .. Return to an Order of the House of the twenty-first day of March, 1894, for a Return of a copy of the report of His Honour the Junior Judge of the County of Essex which led to the dismissal or resignation of Aurele Pacaud, a bailiff of the 7th Division Court of the County of Essex, together with copies of all correspondence, evidence, statements, reports and other papers and documents relating to the matter. Presented to the Legislature, 17th April, 1894. Mr. *White*. *Not printed.*

No. 103... Analysis of Reports of County and Township Agricultural and Horticultural Societies for the year 1893. Presented to the Legislature, 18th April, 1894. *Not printed.*

No. 104... Return to an Order of the House of the twenty-second day of February, 1894, for a Return, duly compiled from the Census Returns for the year 1891, of the Federal Census for the Province, shewing the population for each county and district and the municipalities situate therein, the population of the unorganized territory and the Provincial Electoral Districts. Presented to the Legislature, 18th April, 1894. Mr. *Wood (Brant.)* *Printed.*

No. 105... Return to an Order of the House of the twenty-sixth day of February, 1894, for a Return shewing the number of inquests held during the past three years on the death of persons committed for vagrancy, in the gaols, prisons, houses of correction, lockups or houses of industry, and the cost in connection with the finding of such inquests. Presented to the Legislature, 18th April, 1894. Mr. *Barr (Dufferin.)* *Not printed.*

No. 106... Return to an Order of the House of the sixth day of April, 1894, for a Return from the Provincial Inspector of Registry Offices, from his memoranda made at his inspection of Registry Offices in 1892, of the last instrument received for registration in each municipality in each Registration Division; the last instrument copied in each municipality in each division, and the last instrument compared in each municipality in each division, with a like Return from the same memoranda for 1893, with the dates of the inspections in each division in each year. Presented to the Legislature, 18th April, 1894. Mr. *Wood (Hastings.)* *Printed.*

No. 107... Estimated sales for the year 1894, from the Central Prison Industries. Presented to the Legislature, 19th April, 1894. *Printed.*

No. 108... Return to an Order of the House of the twenty-eighth day of March, 1894, for a Return shewing (1) the salaries of all City and County Treasurers; (2) the total amount of all fees or other emoluments received by the Treasurers by reason of their offices. Presented to the Legislature, 19th April, 1894. Mr. *Bishop.* *Printed.*

No. 109... Return to an Order of the House of the thirtieth day of March, 1894, for a Return shewing the salaries of all City and County Clerks in the Province for the year 1893. Presented to the Legislature, 19th April, 1894. Mr. *Clancy.* *Printed.*

No. 110.. Return to an Order of the House of the fourth day of April, 1894, for a Return of copies of the evidence in the inquest on one Maton, held at the Village of Carleton on October 3rd, 1893, together with copies of all correspondence between the Coroner and the County Crown Attorney and the County Crown Attorney and the Attorney-General. Presented to the Legislature, 20th April, 1894. Mr. *Ryerson.* *Not printed.*

No. 111.. Return to an Order of the House of the ninth day of March, 1894, for a Return shewing separately, the total municipal and school expenditure of each County, Township, City, Town and Village in the Province for the years 1883 and 1893, respectively. Presented to the Legislature, 23rd April, 1894. Mr. *Balfour.* *Printed.*

No. 112.. Return to an Address to His Honour the Lieutenant-Governor of the nineteenth day of March, 1894, praying that His Honour will cause to be laid before this House a Return of a copy of the original plan shewing the location of Russell Square in the City of Toronto, and of all instructions, Orders in Council, minutes and correspondence relating to the survey or laying out of the Square. Also, of a copy of Letters Patent thereof, and of all Orders in Council, minutes and correspondence relating to the issue of such Letters Patent and relating to any subsequent disposition or appropriation of the land, and of all correspondence, petitions and documents with reference to the claim of the Corporation of the City of Toronto to said Square, and the diversion of it from the purposes for which it was originally designed. Presented to the Legislature, 23rd April, 1894. Mr. *Clarke (Toronto.)* *Printed.*

No. 113.. Return to an Order of the House of the fourteenth day of March, 1894, for a Return shewing the full amount of the Government grant to the Agricultural and Arts Board, and a detailed statement of its expenditure for the past five years. Presented to the Legislature, 23rd April, 1894. Mr. *Preston.* *Not printed.*

No. 114.. Return to an Order of the House of the fourth day of April, 1894, for a Return of copies of all correspondence in connection with the granting of a shop license for the sale of liquor to one Joseph Aspinall, of the Town of Tilsonburgh, in the South Riding of Oxford, for the years 1893-4. Also, copies of all papers and documents in possession of the Government, or any official thereof, relating to the said license, together with a copy of the Report of the Chief Inspector, who enquired into the complaint that the license was fraudulently granted. Presented to the Legislature, 23rd April, 1894. Mr. *McCleary.* *Not printed.*

No. 115.. Petition, correspondence and general information in respect of the application for grants of Public money in aid of the construction of certain portions of the Irondale, Bancroft and Ottawa, the Northern and Pacific Junction, the Ottawa, Arnprior and Parry Sound, and the Ontario and Rainy River Railways. Presented to the Legislature, 25th April, 1894. *Printed.*

No. 116.. Return to an Order of the House of the sixth day of April, 1894, for a Return from each Registration Division in Ontario, shewing all losses sustained by reason of errors or omissions on the part of officials of said divisions, with the names of parties to whom paid; dates of payment and the nature of error or omission, such Return to extend over the last ten years. Presented to the Legislature, 26th April, 1894. Mr. *Wood (Hastings.)* *Printed.*

No. 117.. Return to an Order of the House of the second day of March, 1894, for a Return from each municipality in the Province, other than Counties, showing that the rate of taxation therein (1) for municipal purposes, (2) for school purposes, (3) total. Presented to the Legislature, 26th April, 1894. Mr. *Clarke (Lanark.)* *Printed.*

No. 118.. Rules, Orders and Forms of the Division Courts of Ontario, as adopted by the Board of County Judges, 1894. Presented to the Legislature, 26th April, 1894. *Not printed.*

No. 119.. Return to an Order of the House of the nineteenth day of March, 1894, for a Return, shewing the number of acres sold by the Government in what was called the Disputed Territory, and shewing also the number of square miles of timber limits under license therein, and what has accrued by way of revenue up to the fifteenth day of March, 1894. And what has, during the same period, been expended by the Province within the said Territory. And also, what is the liability of the Province in respect of Indian Lands. Presented to the Legislature, 26th April, 1894. Mr. *Gibson (Huron.) Printed.*

No. 120.. Return to an Order of the House of the ninth day of April, 1894, for a Return shewing the date of the appointment of F. Maguire, of St. Catharines, as Inspector of immigrants at Niagara Falls, Ontario. Shewing also, what duties he performs; how many hours daily he is on duty and what salary he receives. And if he is still under pay, what allowance he receives; what are his qualificatians for the office, and if he has had any medical training. Shewing also, by whom his duties are performed during his absence; who performed similar duties before his appointment, and at what salary. Shewing also, if there are similar officials at other points on the frontier, giving name, dates of appointment and salaries. Presented to the Legislature, 26th April, 1894. Mr. *McCleary. Not printed.*

No. 121.. A compilation of the Labour Laws. Presented to the Legislature, 27th April, 1894. *Printed.*

No. 122.. Return to an Order of the House of the fifth day of March, 1894, for a Return shewing the date of the dismissal of William Young, Farm Instructor at the Reformatory for Boys at Penetanguishene. The length of time he was in the service; the cause of his dismissal; the amount paid him as a gratuity, together with the amounts, if any, paid him for rent allowance or otherwise since his dismissal. Also, copies of all correspondence between the said Young and the Government, or any officer thereof, relating to his dismissal, the payment of a gratuity or otherwise. Presented to the Legislature, 27th April, 1894. Mr. *Clancy. Not printed.*

No. 123.. Report of the Provincial Inspector into the charges preferred against J. B. White, License Inspector for the District of Manitoulin, together with a copy of the evidence taken at the investigation. Presented to the Legislature, 27th April, 1894. *Not printed.*

No. 124.. Commission, evidence and report in respect of the inquiry concerning the Agricultural College and Experimental Farm held by John Winchester, John Watterworth and John S. Pearce, Esquires. Presented to the Legislature, 27th April, 1894. *Not printed.*

No. 125. Return to an Order of the House of the twenty-third day of April, 1894, for a Return setting forth the Cities, Towns and Incorporated Villages in Ontario in which Free Libraries and Mechanics' Institutes have been established. Shewing, as well, the unincorporated Villages in which Mechanics' Institutes or reading rooms have been established, and shewing the Electoral Districts in which Farmers' Institutes have not been established. Presented to the Legislature, 27th April, 1894. Mr. *Wood (Brant.)* *Not printed.*

No. 126. Return to an Order of the House of the twentieth day of April, 1894, for a Return of copies of all correspondence and communications which have passed between the Municipal Council of the Town of Goderich, or any officer or member thereof, or any ratepayer of the said town, and any member or officer of the Government, with reference to the appointment of a Police Magistrate for the said town; and also, of all Petitions for or against the appointment. Presented to the Legislature, 27th April, 1894. Mr. *Whitney.* *Not printed.*

No. 127. Return to an Order of the House of the thirtieth day of March, 1894, for a Return of copies of all papers, letters, statements and documents in connection with the charges of G. A. Dorian, against Dr. P. H. Bryce, Secretary of the Provincial Board of Health, with a copy of the evidence adduced, and the finding of the Commissioners. Presented to the Legislature, 30th April, 1894. Mr. *Ryerson.* *Not printed.*

No. 128. Return to an Order of the House of the eighteenth day of April, 1894, for a Return shewing what amount of the Public School grant—not including the Poor Schools grant—was apportioned to cities, towns, and those incorporated villages containing High Schools or Collegiate Institutes for the years 1882 and 1892 respectively, and the amount to the remaining municipalities of the Province. Presented to the Legislature, 30th April, 1894. Mr. *Meacham.* *Not printed.*

No. 129. Return to an Order of the House of the twenty-third day of April, 1894, for a Return of a detailed statement, for the years 1890 and 1891, of the fees and emoluments of the Registrar of Deeds for the County of Dufferin in connection with his office, with the dates and amounts of rebates for each year paid to the County. Presented to the Legislature, 30th April, 1894. Mr. *Barr (Dufferin.)* *Not printed.*

No. 130. Return to an Order of the House of the eighth day of May, 1893, for a Return shewing the names of all persons, firms or companies, indebted to the Province on the first day of January, 1893, on account of timber dues, ground rent or bonuses for timber limits; the amount of indebtedness in each case; the balance, if any, due by such persons, firms or companies on the first day of January, in each year since 1886, and the total amount of such indebtedness on the first day of January, 1893. Presented to the Legislature, 4th May, 1894. Mr. *Wood (Hastings.)* *Not printed.*

NINETEENTH ANNUAL REPORT

OF THE

ONTARIO AGRICULTURAL COLLEGE

AND

EXPERIMENTAL FARM

FIFTEENTH ANNUAL REPORT

OF THE

AGRICULTURAL AND EXPERIMENTAL UNION

1893

PRINTED BY ORDER OF THE LEGISLATIVE ASSEMBLY.

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1894.

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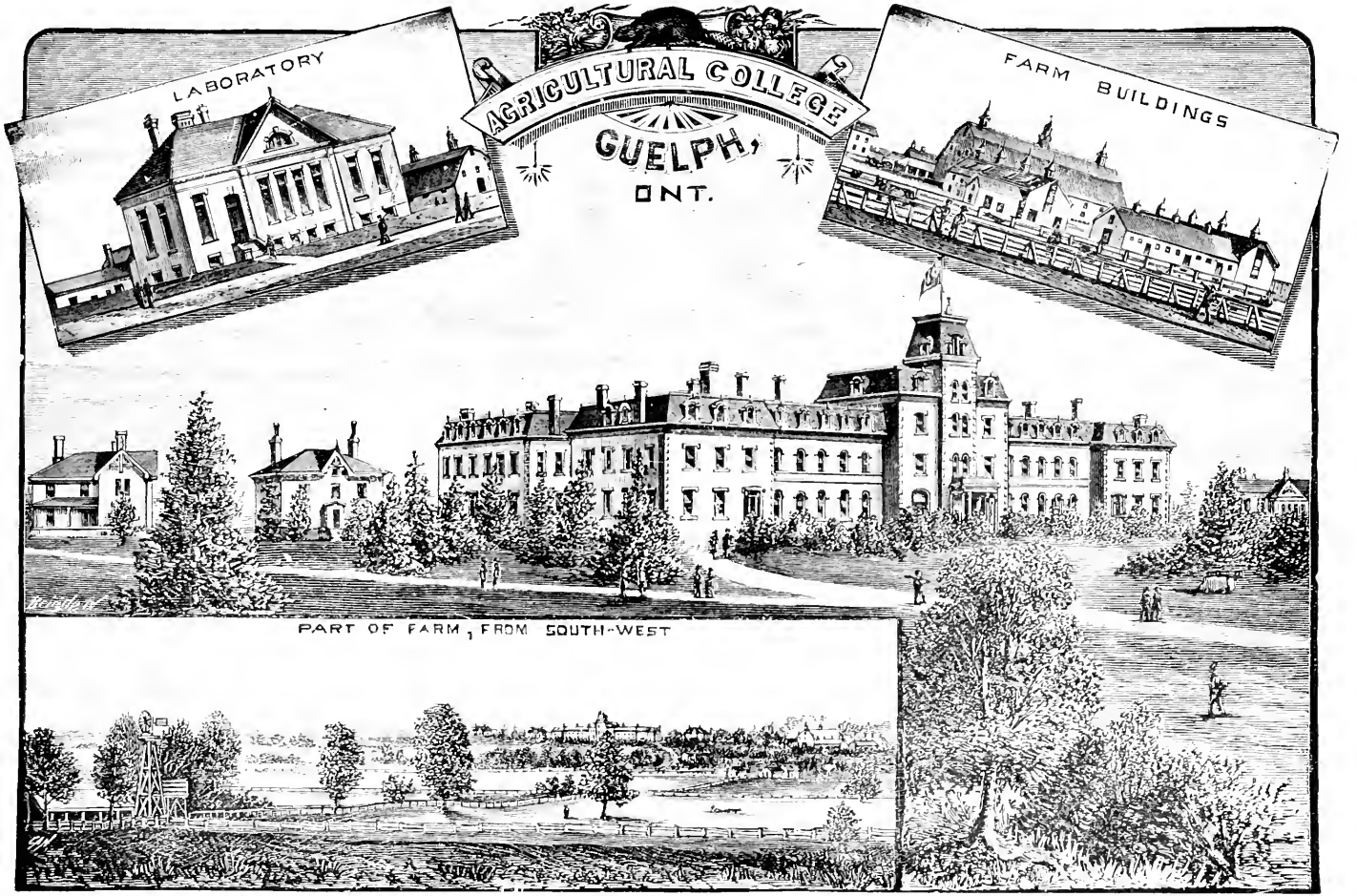
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AGRICULTURAL COLLEGE
GUELPH,
ONT.
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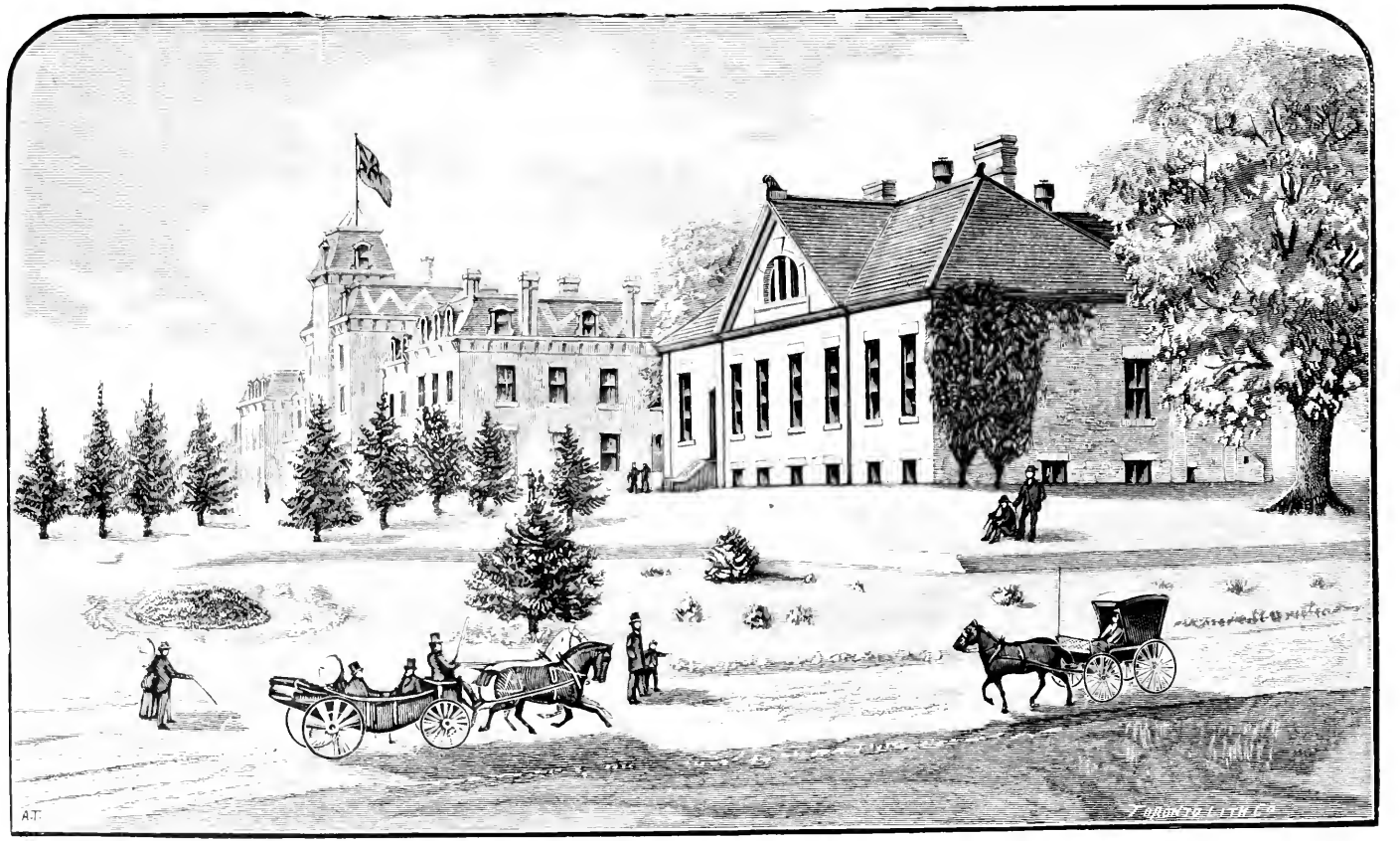

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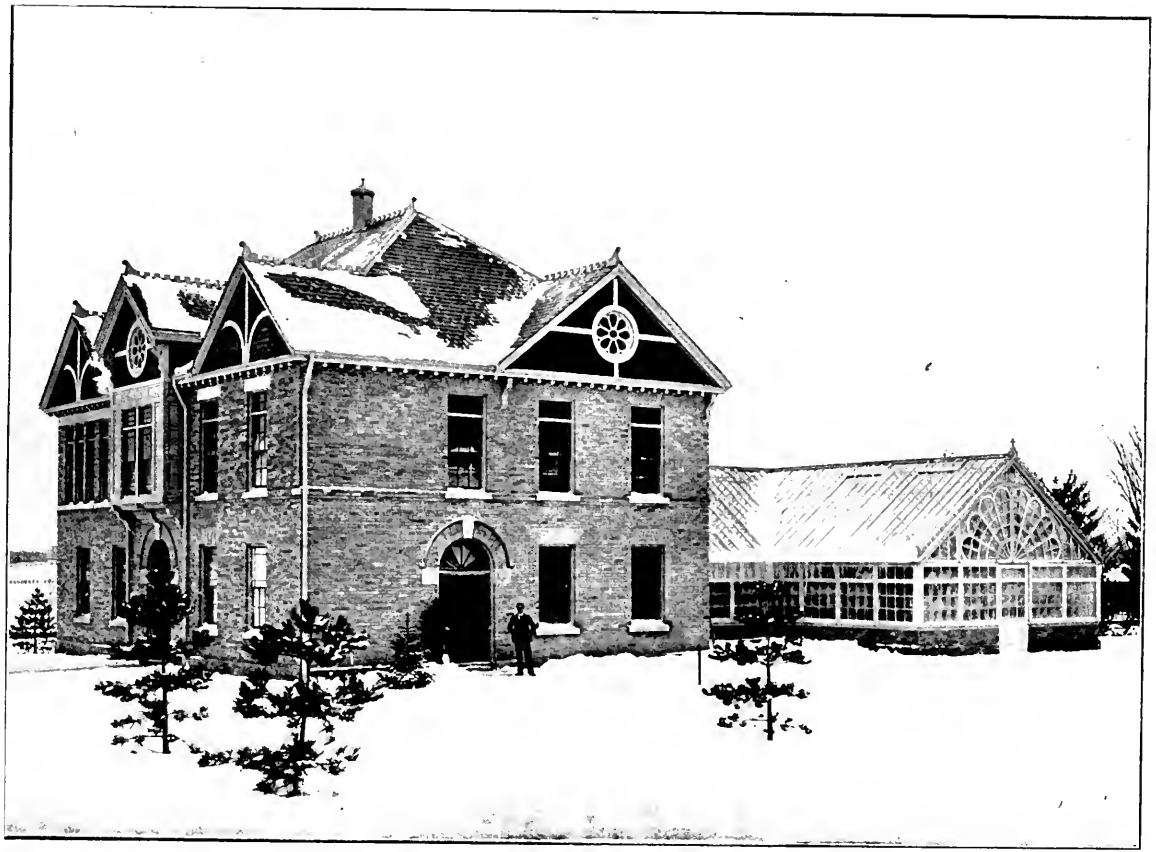

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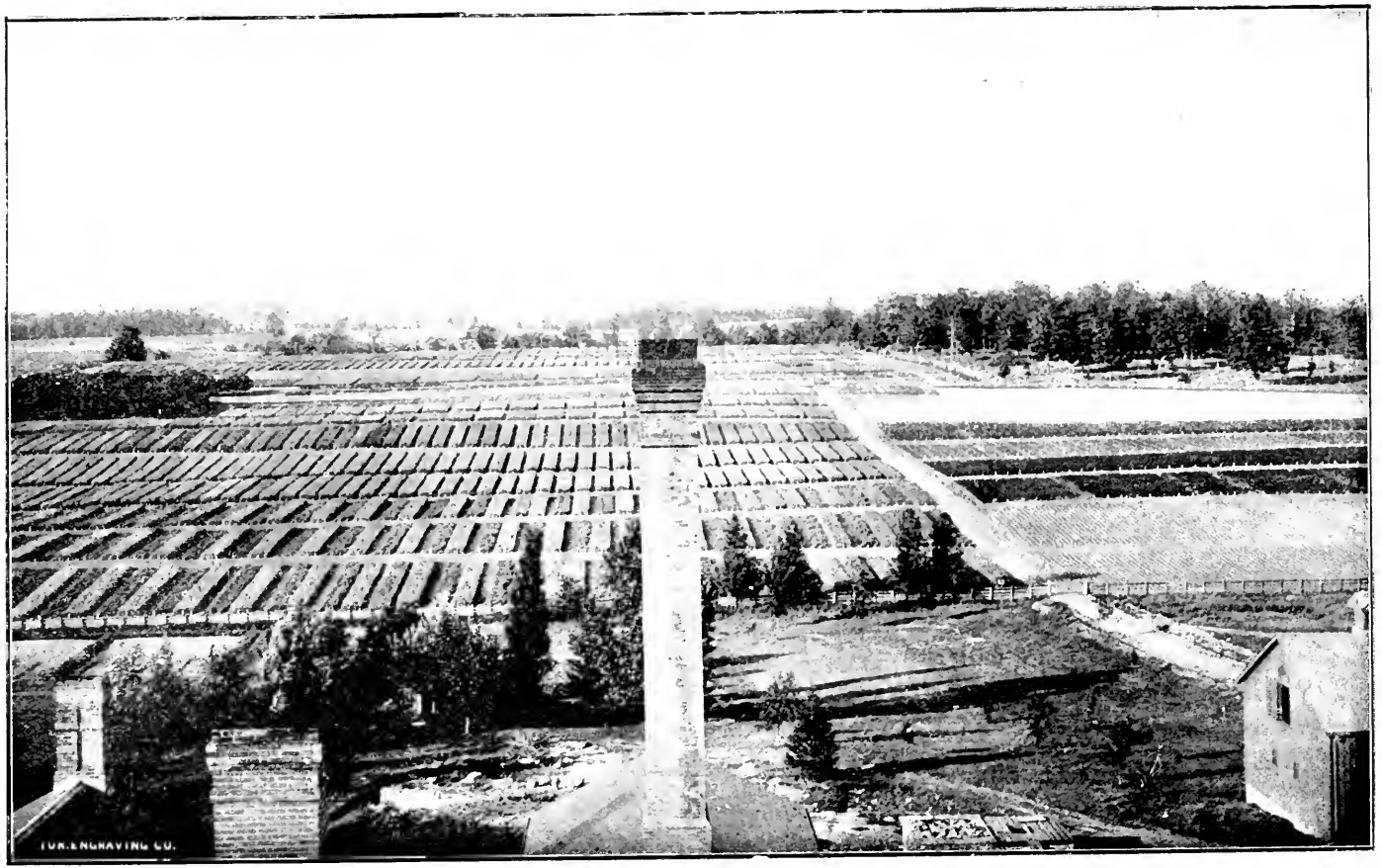

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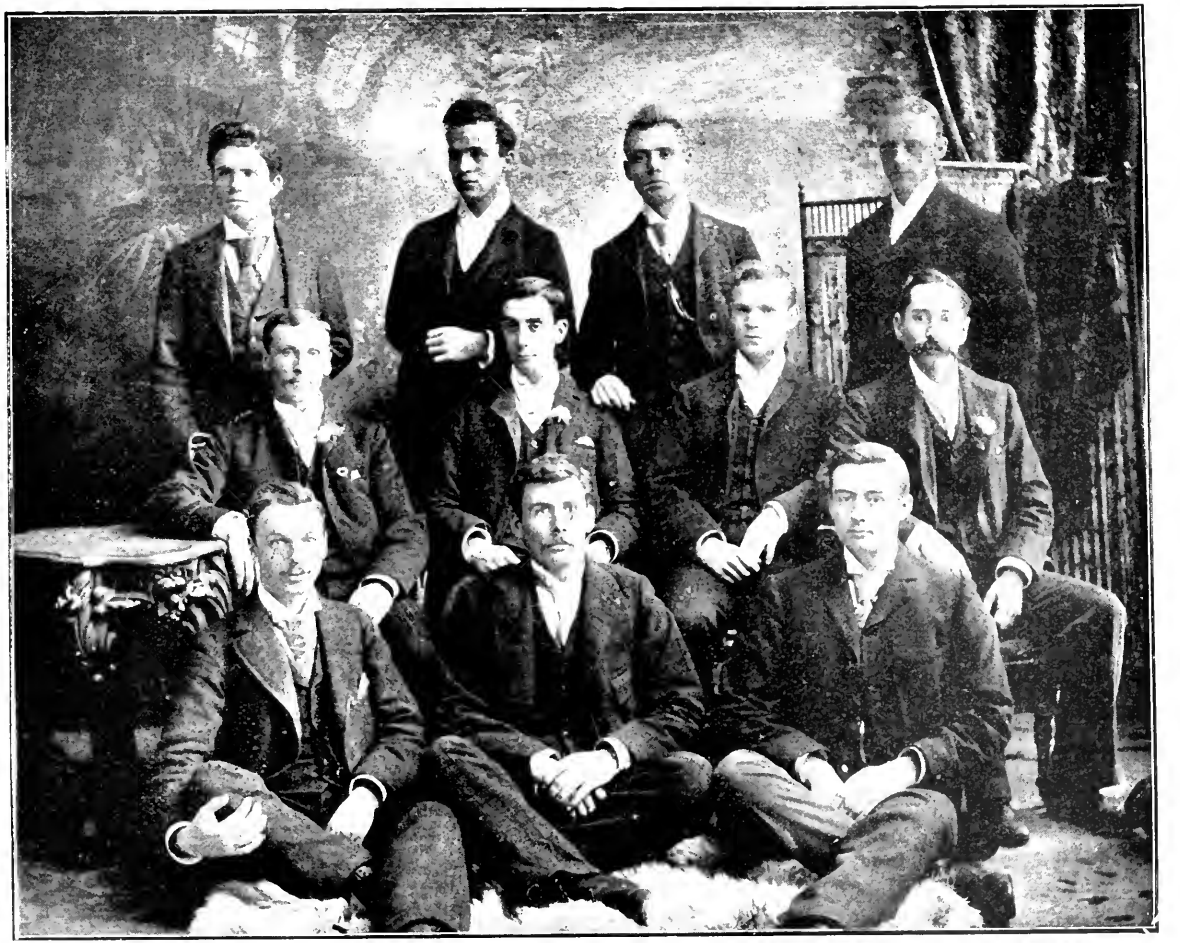

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NINETEENTH ANNUAL REPORT

OF THE

ONTARIO AGRICULTURAL COLLEGE

AND EXPERIMENTAL FARM.

GUELPH, January 2nd, 1894.

To the Honorable JOHN DRYDEN,
Minister of Agriculture:

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

In this Report we have reviewed briefly the work of the year 1893, under the following heads:

I have the honor to be, Sir,

Your obedient servant,

JAMES MILLS,
President.

MINISTER OF AGRICULTURE,

Hon. John Dryden, Toronto.

Ontario Agricultural College and Experimental Farm, Guelph, under Control of the Minister of Agriculture.

OFFICERS, 1893.

James Mills, M.A., LL.D.,	President.
J. Hoyes Panton, M.A., F.G.S.,	Professor of Geology and Natural History.
A. E. Shuttleworth, B.A. Sc.,	Professor of Chemistry.
J. Hugo Reed, V.S.,	Professor of Veterinary Science.
H. H. Dean, B.S.A.,	Professor of Dairy Husbandry.
J. B. Reynolds, B.A.,	Assistant Resident Master.
William Rennie,	Farm Superintendent.
C. A. Zavitz, B.S.A.,	Experimentalist.
G. E. Day, B.S.A.,	Lecturer on Agriculture.
H. L. Hutt, B.S.A.,	Lecturer on Horticulture.
R. Harcourt, B.S.A.,	Assistant Chemist.
Captain Walter Clarke,	Instructor in Drill and Gymnastics.
A. McCallum,	Bursar

ADVISORY BOARD.

C. C. James, M.A.,	Deputy Minister of Agriculture, Toronto.
John I. Hobson,	Mosborough, County of Wellington.
John McMillan, M.P.,	Constance, County of Huron.
Edward Jeffs,	Bond Head, County of Simcoe.
J. S. Smith,	Maple Lodge, County of Middlesex.
G. B. Boyce,	Norham, County of Northumberland.
D. A. Dowling,	Appleton, County of Carleton.
Wm. Donaldson,	South Zorra, County of Oxford.
Chairman of Board,	John I. Hobson.
Secretary of Board,	C. C. James.

PART I.

REPORT OF THE PRESIDENT.

In consequence of an extreme pressure of work, my report for 1893 will be shorter than might be expected from the President of an institution which receives so much attention at home and abroad as the Ontario Agricultural College and Experimental Farm.

Progress.

Those who have visited our College from time to time have observed, above everything else, that our history has been one of continuous progress in the improvement of our equipment, the enlargement of our staff, and the extension of our work. The year 1893 has not been an exception in this respect. It has been marked by progress on several lines—the completion of our greenhouses, the construction of a large farm piggery, the erection of a dairy building and two dairy cottages, the appointment of a lecturer on horticulture, the organization of a summer school for teachers, and the commencement of a home dairy course for farmers' sons and daughters.

Students in Attendance.

The attendance of students is quite satisfactory. We began the year with all rooms occupied; and in October last we had applicants for every vacancy. The total number on the roll in 1893 was as follows:

Regular students	186
Dairy students	60
	246

To these may be added an attendance of 34 at our summer school in July last, making a grand total of 280.

For the information of those who wish to know the facts regarding our attendance, I may repeat what I have often stated, viz., that the number on the roll for the whole year is always considerably larger than the number in attendance in any particular term. This is due to the fact that the associates and graduates of each year leave on the 1st of July, and new students are admitted to take their places. The following table shows the attendance for the last sixteen years, and indicates the places whence our students have come:

COMPARATIVE STATEMENT OF ATTENDANCE.

Year.	Ontario.	Other Provinces.	British Isles.	United States.	Other Places.	Total.
1878	122	18	6	.....	.....	146
1879	141	18	3	.....	.....	162
1880	142	25	8	1	.....	176
1881	164	33	18	1	1	217
1882	144	27	30	1	4	206
1883	134	34	30	2	2	202
1884	120	32	32	2	2	188
1885	103	28	41	.....	3	175
1886	94	20	33	.....	2	149
1887	78	12	20	.....	.....	110
1888	91	9	26	.....	5	131
1889	94	10	22	1	7	134
1890	107	16	17	1	5	146
1891	103	9	16	1	3	132
1892	131	10	13	1	4	159
1893	207	15	18	1	5	246

STUDENTS IN GENERAL AND SPECIAL COURSES FOR LAST FOURTEEN YEARS.

1880—Students in General Course	166	
Students in Short Winter Course	10	
Total		176
1881—Students in General Course	199	
Students in Short Winter Course	18	
Total		217
1882—Students in General Course	181	
Students in Short Winter Course	10	
Students in Special Live Stock Course	15	
Total		206
1883—Students in General Course	187	
Students in Special Live Stock Course	15	
Total		202
1884—Students in General Course	162	
Students in Special Live Stock Course	26	
Total		188
1885—Students in General Course	170	
Students in Special Live Stock Course	5	
Total		175
1886—Students in General Course		149
1887—Students in General Course		110
1888—Students in General Course		131
1889—Students in General Course		134
1890—Students in General Course		146
1891—Students in General Course		132
1892—Students in General Course		159
1893—Students in General Course	186	
Students in Dairy Course	60	
Students in Teachers' Course	34	
Total		28

ATTENDANCE IN FALL TERM 1883 AND 1893. THE YEARS RECENTLY SELECTED FOR COMPARISONS.

Fall Term, 1883—In General Course	94	
In Special Live Stock Course	15	
Total		109
Fall Term, 1893—In General Course		111

Without the dairy students, we have had 147 from Ontario in 1893. See the College roll in Appendix I.

CLASSIFICATION OF STUDENTS ON ROLL IN 1893:

Students in the general course:		
Third year	23	
Second year	53	
First year	110	
		186
Dairy students		60
Total		246

COUNTY STUDENTS.

Each county in the Province is allowed to send one student free of tuition. The nomination is made by the County Council. Of those on the roll in 1893, fifty were so nominated, and as a consequence, were exempted from the payment of tuition fees. The counties represented were the following:

Brant, Bruce, Carleton, Dundas, Durham, Elgin, Essex, Frontenac, Glengarry, Grenville, Grey, Halton, Huron, Kent, Lambton, Lanark, Leeds, Lennox, Lincoln, Middlesex, Muskoka, Norfolk, Ontario, Oxford, Parry Sound, Peel, Perth, Peterboro', Prescott, Prince Edward, Renfrew, Simcoe, Stormont, Waterloo, Wellington, Wentworth, York.

FEES.

Ontario students not nominated by county councils pay a tuition fee of $20 a year, and non-residents (from other Provinces, Great Britain, and elsewhere) pay a fee of $100 the first year and $50 the second year. If a non-resident student has had a year's experience in practical work on a farm, his tuition fee for the first year is $50.

RELIGIOUS DENOMINATIONS.

Students in General Course:		Dairy Students:	
Methodists	62	Methodists	25
Presbyterians	53	Presbyterians	21
Episcopalians	45	Episcopalians	5
Baptists	13	Baptists	5
Congregationalists	6	Roman Catholics	3
Roman Catholics	4	Congregationalists	1
Friends	2		60
Evangelical Reform	1		
	186		

STUDENTS IN GENERAL AND DAIRY COURSES.

Methodists	87	Congregationalists	7
Presbyterians	74	Roman Catholics	7
Episcopalians	50	Friends	2
Baptists	18	Evangelical Reform	1
		Total	246

AGES OF STUDENTS IN GENERAL COURSE.

8	16 years of age.	4	24 years of age.
23	17 "	5	25 "
30	18 "	2	26 "
17	19 "	5	27 "
25	20 "	4	28 "
31	21 "	1	29 "
17	22 "	1	30 "
12	23 "	1	32 "

Average age—21 years.

CHANGES IN STAFF.

Several changes in our staff have taken place since the issue of our last report. H. B. Sharman, B.S.A., Assistant Chemist, resigned his position on the 1st of August, and the vacancy was filled by the appointment of Robert Harcourt, B.S.A., on the 1st of December. On the 1st of October, John McCrae, our Assistant Resident Master, returned to the University to complete his course, and J. B. Reynolds, B.A., was chosen as his successor. Prof. Shaw left for Minnesota at the same time; and his place was filled by making C. A. Zavitz, B.S.A., head of the Experimental Department, appointing G. E. Day, B.S.A., Lecturer on Agriculture, Live Stock, etc., and placing Wm. Rennie of Swansea, in charge of the farm. As Farm Superintendent, Mr. Rennie devotes his whole time to the management of the farm and live stock, and the control and oversight of men and students at work. By this arrangement, the office of Farm Foreman has been dispensed with, and the services of J. E. Story, who has held the position since July, 1887, are no longer required.

HORTICULTURAL DEPARTMENT.

We have had an efficient foreman in this department from the beginning, but until this year we have never had anyone to discharge the functions of Professor of Horticulture—one who would devote his whole time and attention to work and instruction in this department. We have often felt the need of such an officer, but, till recently, we have not had the buildings and other appliances necessary to warrant the appointment of a professor.

In 1891, we constructed four new greenhouses, and erected a large botanical laboratory. The laboratory, which contains a class-room and offices for the Horticulturist and the Professor of Botany, was completed and furnished in 1892; and during the summer of 1893 we built two additional greenhouses, and divided one into sections for practical work by students. These houses are now completely furnished, and ready for the most thorough and advanced work in botany and horticulture. Everything being in shape for satisfactory work, H. L. Hutt, B.S.A., was appointed Lecturer on Horticulture in May last. Mr. Hutt was brought up in the Niagara district, is an enthusiastic horticulturist, and enters upon his duties with everything in his favour. I have faith in his ability and industry, and have no doubt that he will do work which will be of much benefit, not only to our students, but to the country at large.

Library and Biological Department.

For some time past the Professor of Natural History has been in a general way responsible for the reading-room, library, and museum. Till the end of 1892, a student was employed to put papers on file in the reading-room, and attend in the library at stated intervals; but this arrangement became more and more unsatisfactory, till at length we had to ask for the appointment of some one to look after the reading-room, take charge of the library, and assist Professor Panton in a variety of special work in connection with his department.

No one has yet been appointed to this work, but F. C. Harrison, B.S.A., has faithfully and efficiently discharged the duties of the position since the 1st of May last. During the spring and summer Mr. Harrison gave some attention to the library and reading-room, but spent most of his time in looking after Prof. Panton's botanical instruction beds, performing certain experiments under the direction of Prof. Panton, collecting and arranging plants and entomological specimens, and taking note of insect pests and their ravages in this vicinity. During the fall and early winter he has been making slides for the magic lantern, and preparing and mounting objects for microscopic work in the second and third year classes, but has spent the greater part of his time in arranging and indexing books in the library. Henceforth we hope to make the library more useful to our students.

Farm Proper.

About 330 acres of our College land is managed as an ordinary farm. Work in this department has gone on as usual throughout the year. Our cattle have done fairly well. Our sheep also are in good health, and look much better than usual. We have a flock of very nice young rams and ewes, of different breeds, which we hope to sell by auction in September or October, 1894. Our pigs have paid much better than anything else this year. As yet we have only three breeds—Berkshire, Tamworth, and Improved Yorkshire—but in the large farm piggery recently built, we have room for two or three other breeds, and we may possibly try the Chester Whites and Poland Chinas next year.

The sides of the road north of the College grounds were plowed last spring, and allowed to rot during the summer. In the early part of October they were plowed a second time, and in November the work of straightening and grading began. This work was done chiefly by the students in charge of Mr. Story, the Farm Foreman, under the direction of Mr. Rennie, our new Farm Superintendent. The whole road, sides and centre, is now in splendid shape, and the work done upon it will be a great improvement to that side of the College grounds.

Mr. Rennie has also graded the road leading from the College to the experimental grounds. He spent a good deal of time in paving the sides of this road and in ridding up the unsightly yard which for a long time has been a discreditable eyesore below the carpenter shop and implement shed. That part of the grounds now looks as neat and tidy as any other section of the College lawn.

I mention these last two items under this head, because the work was done by the Farm Proper.

Experimental Department.

Our experimental work has been carried on with vigor throughout the year, especially in testing varieties of grain, dates of seeding, and methods of cultivation.

On the plots at the College, Mr. C. A. Zavitz, our experimentalist, tested 70 varieties of winter wheat, 73 of spring wheat, 73 of barley, 133 of oats, 81 of peas, 3 of buckwheat, 157 of potatoes, 54 of Swede turnips, 37 of fall turnips, 49 of mangels, 10 of sugar beets, 33 of carrots, 93 of fodder corn, 10 of millet, 2 of sunflower, 12 of rape, 18 of clover, and 40 of grasses. He has also tried different dates of seeding on 16 plots, mixtures of grain on 107 plots, application of different fertilizers on 30 plots, different methods of cultivating fodder corn, potatoes, and roots on 150 plots, methods of preparing potatoes for planting on 20 plots, and miscellaneous experiments on 161 plots.

To this may be added some live stock experiments, conducted under the supervision of Mr. Zavitz, as follows :

With steers	2 experiments	6 animals.	
" cows	1 experiment	4	"
" lambs	3 experiments	160	"

For detailed information on the nature and results of all these experiments, see report of the Experimentalist in Part VIII. of this volume.

In addition to the experiments at the College, the following valuable work has been done under the control and supervision of our Experimentalist, with the assistance of a committee appointed annually by the Ontario Agricultural and Experimental Union :

Co-operative Experiments in Agriculture, conducted by Ex-students of the College and other interested Farmers throughout Ontario.

Numbers of Experiments.	Names of Experiments.	Number of Plots required for each Experiment.	Class of Experiments.	Number of Plots used for these Tests by Farmers over Ontario.		
				1891.	1892.	1893.
1	Testing nitrate of soda, superphosphate, muriate of potash, mixture, and no manure, with oats...	5	Fertilizers.	70	165	322
2	Testing nitrate of soda, superphosphate, and no fertilizer, with rape.....	3				
3	Ascertaining the relative value of three varieties of millet.....	3	Fodder crops.	196	470	894
4	Growing Lucerne as a crop for fodder.....	1				
5	Testing six promising varieties of fodder corn	6				
6	Testing five promising varieties of turnips.....	5	Root crops.	350	705	1230
7	Testing five promising varieties of mangels.....	5				
8	Testing five promising varieties of carrots	5				
9	Testing six promising varieties of spring wheat...	6	Grain crops.	2026	4348	4735
10	Testing six promising varieties of barley	6				
11	Testing six promising varieties of oats	6				
12	Testing four promising varieties of peas.....	4				
13	Testing four promising varieties of winter wheat..	5				
				2642	5688	7181

There were 1,204 experimenters over Ontario in 1893, and 7,181 plots were used for the tests.
See report of Experimental Union after Part IX. in this volume.

Dairy Department.

Our Dairy Department has kept pace with the rapid growth of interest and enterprise in dairy matters throughout the Province. We have, I think, led the van in one or two instances, especially in the matter of dairy instruction—in our Dairy School at the College, and by means of the Travelling Dairies throughout the Province.

Our Dairy School last winter was in every sense a marked success, and the applications for admission being so many more than we could accept, we decided that we should make an effort to increase our accommodation. The Minister of Agriculture, promptly taking in the situation, authorized the necessary expenditure, and we went to work—completed our dairy stables, enlarged our cheese-curing room, put in a new engine, built a dairy waggon shed and two dairy cottages, and let the contract for a large dairy building for milk-testing and butter-making on the factory plan. The result is that we now possess one of the most complete dairy establishments to be found anywhere on this continent. We have commodious dairy stables, with a circular silo attached and a waggon shed close by, an annex containing a cream separator run by tread power, a dairy piggery, and dairy cottages for our head dairyman and dairy cattleman; also apartments for a home dairy course, and a cheese-room, butter room, separator-room, and laboratory for work on the factory plan; likewise a large lecture room, a live stock class-room, and a general business office, with cloak, sitting and bath-rooms for both ladies and gentlemen—all heated by steam and well ventilated.

The following is a copy of the special dairy circular which we issued on the 15th December:

DAIRY SCHOOL.

Our Dairy School, opened on the 1st of February last, was an experiment. When our first special dairy circular was issued, we were doubtful as to what the result would be. Our misgiving, however, soon came to an end. The attendance was all we could desire. Our instructors did their work satisfactorily; and, at the end of the session, both students and teachers were more than satisfied. As a consequence, the Dairy School is now an established department of our College work.

A large new dairy building has been erected, which will enable us to accommodate twice as many students as we had last year. We have enlarged our cheese-curing room, and are putting in four new cream separators, of different kinds; new vats, churns, workers, etc., in the butter department; and a complete outfit in a large new room for milk-testing.

With these new applicances, in addition to new lecture and live stock rooms, new library, sitting rooms, cloak and bath-rooms for both ladies and gentlemen, we hope to be able to give a very thorough, complete, and in every way satisfactory course of theoretical and practical instruction in milk-testing, cheese-making, and butter-making.

Length of the Course.

The school will open on the 15th of January, and continue in session for two months. When the dairy students leave, the instructors will devote their attention to our regular students for half a month.

Lectures.

A course of fifty lectures will be given as follows:

Professor of Dairying. Thirty lectures on milk, butter, and cheese; milk-testing, butter-making, and cheese-making; the marketing of dairy products; selection, breeding, and feeding of dairy stock, etc., etc.

Lecturer on Agriculture. Three lectures on general Agriculture in relation to dairying.

Professor of Veterinary Science. Three lectures on the diseases and treatment of dairy stock.

Professor of Biology. Four lectures; two on geology and two on botany.

Professor of Chemistry. Four lectures on the nomenclature and general principles of chemistry and its relation to dairying.

Mathematical Master. Six lectures on mathematics and book-keeping, explaining fully the decimal system.

Lectures will commence at 8.30 a.m., and will continue for one hour, after which the students will be distributed to the different departments for practical work. A portion of each afternoon will be devoted to discussions by instructors and students on special points, and difficulties to be overcome, in milk-testing, butter-making, cheese-making, etc. Some time will also be spent in discussing the best methods of feeding, salting, watering, and managing dairy cattle.

Practical Work.

Students will be sent in rotation to (1) the cheese room ; (2) laboratory for milk-testing ; (3) cream separator, and (4) churns, butter-workers, etc. When possible some latitude will be allowed in the selection of work ; but as a rule, the regular rotation will be followed. Work will commence immediately after the morning lecture and continue until each student has finished the part assigned to him, including all necessary cleaning, tidying up, etc.

In the butter department, full and detailed instruction will be given in the operation of Cream Separator, Butter Extractor, and other machines, and in the handling of cream, the making, printing, and packing of butter, etc. In the Cheese-room, practical object lessons will be given daily on the best methods of making cheese on the factory plan, and full instructions as to the use of rennet tests, the proper care and curing of cheese, etc. Likewise, in the Laboratory full information, with practice in the testing of milk, will be given daily throughout the course.

Some attention will also be given to the judging of butter and cheese. Samples will be obtained from time to time : the students will be required to judge them by points ; and their judgment will be compared with that of experts.

Home Dairy Course.

For those who do not want, or cannot take, the factory course, we have provided a short Home Dairy Course. This is intended especially for farmers and their sons and daughters who may wish to learn something about the latest utensils and appliances used in private dairies; the best methods of setting milk and handling cream ; the important points in churning ; the salting, working, printing, packing, and marketing of butter ; the use of the Babcock milk-tester, and the running of cream separators by hand, tread power, and steam.

Students in the Farm Dairy Course will have the privilege of attending all lectures given to students in the factory course. A portion of our dairy building has been set apart exclusively for home dairy work ; and our own butter-maker will devote his undivided attention to the students in this department from the 15th January to the 1st April, 2½ months.

Applicants for this course, may commence on the 15th January, or at any time thereafter and remain as long as they think proper. Those who apply, will please state when they wish to enter and how long they propose to stay.

Instructors.

The following instructors will take charge of the work in the different departments, under the control of H. H. Dean, Professor of Dairying :

1. In Cheese-making. Instructor, Adam Bell, Tavistock, Ont.

Assistant, T. B. Millar, Burgoyne, Ont., Instructor and Inspector of Western Dairymen's Association.

2. Milk-Testing. Instructor, L. A. Zufelt, Chesterville, Ont.

3 Cream Separators. Instructor, H. L. Beckett, B.S. A., under the supervision of the Instructor in butter-making.

4. Butter-making. Instructor, Mark Sprague, Ameliasburg, Instructor of Creameries' Association of Ontario.

Assistant, John McTavish, Travelling Dairy butter-maker.

5. Home Dairy Course. Instructor, F. C. Rogers, our own dairyman.

Certificates.

Certificates of standing will be given to those who pass all prescribed written and practical examinations—some during the course and a more difficult one at the close. The standard for passing is 40 per cent., ; for second-class honors, 60 per cent. ; and for first-class honors, 75 per cent.

To any one who holds a general certificate of standing, a special dairy certificate of proficiency in butter-making, cheese-making, or both, will be granted when he has proved his ability to manage a creamery or cheese factory.

(1) by at least two years' experience as manager, one which must be subsequent to his college course.

(2) by sending monthly factory reports during at least one season to our Professor of Dairying ;

(3) by passing a satisfactory inspection as to cleanliness, tidiness, and quality of goods made by him during the season.

Terms of Admission, Cost, etc.

No Entrance Examination required.

Tuition. Free to residents of the Province of Ontario ; to non-residents, $5 for the course.

Incidentals. A payment of $5 in advance for incidental expenses will be required of all students in the regular course. Also, a deposit of $2 to cover possible breakage. This sum of $2, or a portion of it, if not required for breakage, will be refunded when the student leaves.

Board and Lodging can be obtained in Guelph (a mile and a half from the College) at $3 to $3 50 a week, and at $3 for a limited number close to the College grounds.

Working Clothes. Every student must provide two special suits of clothes to be worn in the Dairy—white and blue gingham dress, with white cap and white apron, for ladies ; and white linen or cotton suit, with white cap and white apron, for men.

Applications for admission should be addressed to the President of the College.

Candidates whose applications are accepted will be expected here on the *first day* of the course ; and all students will be required to attend the lectures and practical work regularly and punctually while they remain at the school.

Home Dairy Course. A charge of $2 for incidential expenses, and a deposit of $1.00 to cover breakage. The latter, if not required, will be refunded when the student leaves. One suit of working clothes will be sufficient for this course. Board and lodging the same as for the regular course.

A Prohibition.

Smoking, tobacco-chewing, and spitting in any of the dairy buildings are strictly prohibited.

Ladies Invited

Ladies are invited to take this course—the full course, a portion of it, or the Home Dairy course. The latter is specially intended for them. Five ladies took the course last year, three of whom passed all the prescribed examinations and received certificates. Two of them came out near the head of the list.

Travelling Dairies.

Our Travelling Dairies have continued their work during the year, 1893. They started out on the 1st May and returned on the 28th November. One of them was in charge of W. L. Carlyle, B.S.A., with John McTavish as his butter-maker; the other was represented by G. E. Day, B.S.A., till the early part of September, after which date the work was done by H. L. Beckett, B.S.A., with Jas. Hume as his butter maker.

The counties and territories in which the dairies worked during the season are the following: Lambton, Huron, Bruce, Grey, Dufferin, Simcoe, Ontario, Durham, Peterborough, Victoria, Muskoka, Parry Sound, and Algoma. A considerable amount of time was spent in the northern territories, including Manitoulin and St. Joseph's Islands.

The whole of Ontario has now been covered, excepting Halton, and parts of Peel and York. These counties are, of course, entitled to the same consideration as other portions of the Province, and some districts are asking for a second visit. Hence I would recommend that one of these dairies be kept at work for another year, at least.

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

Class-Room Work.

Our class-room work has gone on as usual during the year. Twelve candidates wrote for the degree of B.S.A. in the University of Toronto, eight of whom passed in everything and four were starred in one subject each—three in drawing and one in Latin. A fair proportion of the first and second year students gained a respectable standing in our College Examinations, but the number of failures is still much larger than it should be. (See class-lists in Appendix IV. at the end of this report.)

Examiners.

The third year Examinations were conducted by the University of Toronto, and those of the first and second years by the Professors of the College, with the assistance of the following outside examiners:

D. Z. Gibson, B.S.A., Willow Grove ..... 2nd Year Chemistry.
T. C. L. Armstrong, M.A., LL.B., ... 2nd Year Literature.
Professor W. J. Alexander, University College ... 2nd Year Literature.
J. M. McEvoy, B.A., LL.B., University College.. Political Economy.
E. L. Hill, B.A., Guelph..... 2nd Year Botany.
William Tytler, B.A., Guelph ..... 1st Year English.

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 of Toronto, in June. The list of candidates is as follows:

Beckett, H. L..... ..... Hamilton, Wentworth, Ont.
Bell, T. G..... Q'Appelle, Assa., N.W.T.
Burns, J. A. S..... ..... Halifax, Nova Scotia.
Crealey, J. E..... Strathroy, Middlesex, Ont.
Curzon, S. R..... Norbiton Place, Surrey, England.
Day, G. E..... ..... Guelph, Wellington, Ont.
Dyer, W. D..... ..... Columbus, Ontario County, Ont.
Eaton, L. W..... Dartmouth, Nova Scotia.
Harcourt, R ... ... St. Anns, Lincoln, Ont.
Shaw, R. S..... Guelph, Wellington, Ont.
Soule, A. M..... Niagara Falls South, Welland, Ont.
Story, H..... ..... Picton, Ont.

"To take supplemental examinations before admission to the degree of B.S.A.: *Latin*, Burns; *Drawing*, Curzon, Eaton, Story."

Messrs. Eaton and Story have since passed the required examinations and received their degrees.

Recipients of Associate Diplomas.

Twenty-three, having completed our regular course of two years, were examined for Associate Diplomas. Of these, nineteen passed in all the subjects, and four were starred as indicated in the list. The diplomas were presented by the Hon. G. W. Ross, Minister of Education, at our closing exercises on the 30th of June, and the names of the recipients are as follows, excepting the four that have stars opposite their names:

Atkinson, James.....Seaforth, Huron, Ont.
Burns, J. H.....Kirkton, Perth, Ont.
*Brooks, W. C.....Brantford, Brant, Ont.
Brown, W. J.....Dunboyne, Elgin, Ont.
Conn, Joseph.....Heathcote, Grey, Ont.
Cooper, W. W.....Kippen, Huron, Ont.
Dean, Fred.....Harley, Brant, Ont.
Elmes, W. A.....Princeton, Brant, Ont.
Ferguson, J. J.....Smith's Falls, Leeds, Ont.
*Hamilton, C. A.....Leamington, Hastings, England.
*Hay, Leopold.....Ruda, Guzowska, Poland.
Husband, E. M.....Cairngorm, Middlesex, Ont.
Kennedy, P. B.....Sarnia, Lambton, Ont.
*Lehmann, R. A.....Orillia, Simcoe, Ont.
McCallum, W.....Guelph, Wellington, Ont.
McCrimmon, W. D.....Glen Roy, Glengarry, Ont.
McNaughton, K.....Walkerton, Bruce, Ont.
McMordie, R.....Kippen, Huron, Ont.
McKenzie, W. G.....Fairview, Oxford, Ont.
Phin, A. E.....Hespeler, Waterloo, Ont.
Roper-Curzon, A. C. H.....London, England.
Spencer, J. B.....Brooklin, Ontario County, Ont.
Stewart, J.....Snake River, Renfrew, Ont.

*To take Supplemental examinations: Brooks, in English Literature: Hamilton, in Geology and Inorganic Chemistry; Hay, in Hydrostatics and English Literature; Lehmann, in Analytical Chemistry.

First-Class Men.

The work in the College is divided into five departments, and all candidates who get an aggregate of 75 per cent. of the marks allotted to the subjects in any department, are ranked as first-class men in that department. We would like to have a larger number of such men, but we are determined that none shall be so ranked unless they really deserve it. The following list contains the names of those who gained a first-class rank in the different departments at the examinations in 1893, arranged alphabetically:

First Year.

1. *Atkinson, John*, Seaforth, Ont.—In three departments; Agriculture, Natural Science, and Mathematics.
2. *Buchanan, J.*, Hensall, Ont.—In one department; Agriculture.

3. *Christian, A. L.*, Danforth, Ont.—In one department ; Mathematics.
4. *James, D. A.*, Nilestown, Ont.—In one department ; Mathematics.
5. *Kennedy, W. A*, Apple Hill, Ont.—In three departments ; Agriculture, Natural Science, and Mathematics.
6. *Macfie, C. M.*, Appin, Ont.—In five departments ; Agriculture, Natural Science, Veterinary Science, English Literature, and Mathematics.
7. *Newman, W. M.*, Gilbert's Mills, Ont.—In one department ; Mathematics.
8. *Pettit, F. E.*, Burgessville, Ont.—In one department ; Mathematics.
9. *Robertson, G. A*, Kingston, Ont.—In four departments ; Agriculture, Natural Science, Veterinary Science, and Mathematics.
10. *Rowe, G. F.*, London, England.—In one department ; Natural Science.
11. *Werry, M. J*, Tyrone, Ont.—In three departments ; Agriculture, English, and Mathematics.
12. *Wheatley, John*, Blackwell, Ont.—In two departments ; Natural Science, and Mathematics.

Second Year.

1. *Atkinson, James*, Seaforth, Ont.—In five departments ; Agriculture, Natural Science, Veterinary Science, English Literature, and Mathematics.
2. *Ferguson, J. J.*, Smith's Falls, Ont.—In five departments ; Agriculture, Natural Science, Veterinary Science, English Literature, and Mathematics.
3. *Kennedy, P. B.*, Sarnia, Ont.—In one department ; English Literature.
4. *McCallum*, W., Guelph, Ont.—In four departments ; Agriculture, Natural Science, Veterinary Science, and Mathematics.
5. *McKenzie, W. G.*, Fairview, Ont.—In three departments ; Agriculture, Veterinary Science, and Mathematics.
6. *McCrimmon, W. D.*, Glen Roy, Ont.—In one department ; Veterinary Science.
7. *McMordie, R.*, Kippen, Ont.—In one department ; Veterinary Science.
8. *Phin, A. E*, Hespeler, Ont.—In one department ; Mathematics.
9. *Spence, J. B*, Brooklin, Ont.—In two departments ; Agriculture, and Veterinary Science.

MEDALISTS.

Medals were given to the three students who ranked highest in general proficiency in the theory and practice of the second year. The following were the successful competitors :

Gold Medalist. James Atkinson, Seaforth, Ont.
Stanley Silver Medalist. J. J. Ferguson, Smith's Falls, Ont.
Second Silver Medalist. Wm. McCallum, Guelph, Ont.

FIRST YEAR PRIZEMEN.

Agriculture and Dairying. 1st, C. M. Macfie, Appin, Middlesex, Ont.; 2nd, G. A. Robertson, Kingston, Frontenac, Ont.

Natural Science. 1st, C. M. Macfie ; 2nd, G. A. Robertson.

Veterinary Science. 1st, C. M. Macfie ; 2nd, G. A. Robertson.

English Literature. 1st, C. M. Macfie ; 2nd, M. J. Werry, Tyrone, Durham, Ont.

Mathematics and Book-keeping. 1st, C. M. Macfie ; 2nd, M. J. Werry.

General Proficiency. 1st, C. M. Macfie ; 2nd, G. A. Robertson ; 3rd, M. J. Werry.

Second Year Prizemen.

Agriculture, Live Stock, and Dairying. 1st, James Atkinson ; 2nd, J. J. Ferguson.

Natural Science. 1st, W. McCallum ; 2nd, James Atkinson.

Veterinary Science. 1st, J. J. Ferguson ; 2nd, R. McMordie, Kippen, Huron, Ont.

English Literature and Political Economy. 1st, James Atkinson ; 2nd, J. J. Ferguson.

Mathematics. 1st, W. McCallum ; 2nd, W. G. McKenzie, Fairview, Oxford, Ont.

General Proficiency. 1st, James Atkinson ; 2nd, J. J. Ferguson ; 3rd, Wm. McCallum.

Special Prizes for Essay on Fat Stock Show. 1st, James Atkinson ; 2nd, Wm. McCallum ; 3rd, F. Walker, Norwich, Oxford, Ont.

Closing Exercises.

Our closing exercises for the year took place on the 30th of June. The day was fine and we had a large attendance of visitors, some of whom came a long distance to show their interest in our work. The Hon. G. W. Ross, Minister of Education, and the Rev. E. H. Dewart, D.D., were present and delivered excellent addresses. Mrs. Ross, Mrs. Dewart, and Mrs. Wm. Mulock favored us with their presence ; and also a large number of ladies and gentleman from Guelph, and the surrounding neighborhood.

Valedictory Address.

The valedictory address is always delivered by a second year man. The successful candidate for the honor in 1893, was J. J. Ferguson, Smith's Falls ; and the subject of his address was "Weeds," literal and metaphorical.

On the 1st of June, we sent out the following circular to the Public School Teachers of Ontario :

Short Summer Course in Agriculture.

The great majority of the people of this Province are dependent on our Public Schools for the whole of their secular education. They have neither the time nor the means to attend a High School, an Agricultural College, or University. With such instruction and training as they get in the Public Schools, they are expected to discharge the duties of citizenship and make an honest living for themselves and their families. Hence the Public Schools are in some respects the most important schools in the country ; and in connection with these schools, two things are of the greatest moment : (1) That the course of study be the best possible, and (2) that the teachers be fully equipped for their work.

The primary aim of Public School teachers should undoubtedly be to teach well the elements of a general English education—to give a thorough, exact, and practical course of instruction in reading, writing, spelling, arithmetic, English grammar, composition, and geography ; in other words, to make all their scholars good readers, good writers, correct spellers, good arithmeticians, and correct, if not elegant, speakers and writers of English. This work is of fundamental importance, and nothing should be allowed to interfere with it in any Public School. We insist upon it as the first duty of all Public School teachers ; but, at the same time, we maintain that, in this Province at least, there is also another duty, which, though secondary, is by no means unimportant, viz., to consider the occupation which most of the children will follow on leaving school, and, as far as possible, give them instruction, not only in the elements of a general education, but

also in some of the principles that underlie successful practice in the industry by means of which they will have to earn a livelihood for themselves and those depending upon them.

Two things should not be forgotten: (1) That farming is the main industry in Ontario; (2) That whatever improves the condition of farmers and makes them more successful workers, benefits all classes of the people. These are facts which no one will question; and, because of their importance, some of our best educators and wisest Statesmen are of opinion that the teachers in the Public Schools of this Province should, incidentally or otherwise, give some instruction in agriculture and one or two of the sciences related thereto; should impart as much reliable information as possible about agricultural pursuits; and do all in their power to inspire their pupils with a love for the simplicity, independence, and healthfulness of farm life.

Realizing the importance of this work and believing that valuable instruction in agriculture may be given by simple lectures to children—conversations on soils, plants and animals—so simple that even the lower classes in a Public School may understand, so attractive as to interest the youngest scholars, and of such a character as to benefit all kinds of pupils, whatever their occupation in after life—the Hon. John Dryden, Minister of Agriculture, with the hearty co operation of the Minister of Education, has instructed our staff at the Ontario Agricultural College to offer, to the teachers of Ontario, a short summer course of instruction in agriculture and the sciences most closely related thereto.

Object of the Course. To show how agriculture and kindred branches of knowledge may be taught by simple talks to pupils in Rural Schools, and to furnish information that will serve as a basis for such talks, say the last hour of each Friday afternoon—geology and chemistry in the fall, live stock and dairying in the winter, botany and entomology in the spring.

Subjects. Agriculture, Dairying, Agricultural Chemistry, Geology, Botany, and Entomology.

Practical Work. The forenoons will be devoted to lectures; the afternoons and Saturdays, to geological and botanical excursions in charge of a professor, a certain amount of practical work in laboratories, and observation trips in gardens, fields, and experimental plots.

Time. The course will extend throughout the month of July, commencing on Monday, the 3rd, and ending on the 31st.

Expenses, etc. There will be no tuition fee. Teachers to the number of fifty, male or female, will be provided with rooms and board in the College, for which there will be a charge of $12, payable in advance to the Bursar. Washing will be done in the College laundry, and charged extra, at moderate rates. Sheets and towels, four of each, must be provided by applicants for admission.

The surroundings of the College are pleasant, and of such a character that, in addition to the direct instruction gained by attendance upon lectures, much valuable information may be acquired by observation in the different departments of the institution—the farm, dairy, arboretum, gardens, greenhouses, laboratories, etc.

Candidates for admission will please fill out the enclosed application and send it to the President at the earliest date possible.

In response to this circular, we received nearly fifty applications; but only thirty-four of the applicants came. Of these, seventeen were ladies.

Lectures commenced on the 3rd July, and continued till the 31st August. Most of the teachers boarded in the College, and the work of instruction, theoretical and practical, was done by Prof. Panton, Prof. Shuttleworth, Profs. Shaw and Dean, James Millar, Esq., William Houston, M.A., and the President of the College.

The subjects embraced in the course were as follows: (1) The typical animal for the production of flesh; (2) the form and kind of cow likely to be a profitable dairy animal;

(3) the quality and relative values of the different cuts in a side of beef; (4) the testing and handling of milk and cream, the making and marketing of butter, etc.; (5) general and agricultural chemistry; (6) geology, botany, and entomology; (7) the fundamental principles of political economy.

To be more specific, we may say that the work done during the month was as follows:

Department of Geology and Natural History.

Geology. Nine lectures by Prof. Panton, illustrated by diagrams and specimens; and one specially illustrated by the stereopticon.

Botany. Ten lectures, amply illustrated by diagrams, plants, and flowers; and one especially by the stereopticon.

Entomology. Five lectures, illustrated by numerous specimens.

Practical Work. Eight special lectures on botany, with the analysis and identification of twenty-five plants. One day at practical study of botany in College lawn and arboretum. Trip to Elora for study of geology and botany. Trip to Rockwood for study of geology and botany.

Microscopy. Practical lessons on the following topics, one per day: (1) Pollen and pollinia; (2) crystals in plant tissue; (3) starch granules and aleurone grains; (4) hairs and stomata of leaves; (5) cells, cellular and vascular tissue; (6) the parasitic plants causing rust, smut, potato blight, plum knot, gooseberry mildew, and apple spot; (7) unicellular plants.

In the Department of Chemistry.

(1) A course of twenty lectures by Prof. Shuttleworth, illustrated by experiments in the chemical class-room, and embracing the following topics: The plant in relation to water; plant food in the soil obtained by the plant through its roots; physical characteristics and classification of soils; chemistry of the atmosphere and the food taken by plants from the air; the ways in which plants absorb their food from both soil and atmosphere, and the practical lessons to be learned therefrom, etc.

(2) Practical work in chemical laboratory two afternoons in the week; thirty-three experiments by the members of the class to explain the lectures mentioned above; also numerous other experiments with the essential elements of plant food, etc.—each made by every member of the class.

In the Dairy Department.

(1) Lectures by Prof. Dean on the composition of milk; methods of testing milk, butter, and cheese; payment in creameries and cheese factories according to the percentage of fat in the milk; points essential to success in cheese and butter-making, especially the handling of milk and cream and the things necessary to make good butter in the home dairy.

(2) Some practical work in the College dairy in milk-testing, butter-making, and the running of cream separators.

In the Department of Agriculture.

(1) Nine lectures by Prof. Shaw on beef cattle, dairy cattle, fertilizers, varieties of grain, grain-growing, etc., illustrated by animals in the class-room and plots of grain in the experimental fields.

(2) Lectures by President Mills on the ideal animal for the production of flesh illustrated by specimens of the beef breeds examined and compared in the class-room.

(3) The characteristics and comparative values of the different cuts in the body of an animal, stated and illustrated fully by James Millar, of Guelph, who had his man cut a side of beef into roasts, steak, etc., in presence of the class.

In Economics.

In addition to the work done by the professors of the College, we had four or five clear, suggestive, and practical lectures by Wm. Houston, M.A., on the fundamental principles of political science. These lectures were very instructive, and were of real benefit to those who had the pleasure of hearing them.

In a word, I think I may say that the teachers were very much pleased with the course. They found the professors courteous and attentive, their surroundings at the College pleasant, and the lectures eminently practical and suggestive.

No examination was required, and as a consequence the work was entered into as a kind of recreation.

Farmers' Institutes.

The work of the Farmers' Institutes has greatly increased within the last few years. The first regular institute meetings in Ontario were held in the winter of 1885. In January of that year, we (the professors of the College) assisted in holding twenty-six meetings. From that time to the present there has been a gradual development in the work and usefulness of these important organizations.

Last year, the members of our staff, with the help of a few of our leading farmers, fruit-growers, dairymen, and apiarists, assisted at 119 meetings in the first three weeks of the month of January. In the early part of February, an extra deputation, consisting of John Hannah, Seaforth; D. Z. Gibson, B.S.A., of Haldimand County; and Samuel Howard, of Gorrie, held a number of meetings throughout Muskoka, Parry Sound, and Algoma.

In Appendix VI to this report will be found a list of the meetings to be held in January, 1894, from the 2nd to the 20th inclusive—133 meetings, as arranged for by myself, under instructions from the Minister of Agriculture, and in consultation with T. Lloyd Jones, President of the Central Farmers' Institute. Arrangements will be made for meetings in Muskoka, Parry Sound, and Algoma, at a later date.

Visitors.

During the past year we have had a very large number of visitors from home and abroad.

On the 6th January, the late Governor-General, Lord Stanley of Preston, was with us; and on the 8th April (a very stormy day) the Ontario Legislature paid us a visit. About 12,000 farmers were here in the month of June, and a large number of foreign visitors during the summer and autumn—farmers' delegates from Great Britain, and prominent men from Denmark, Smyrna, Antioch, Beyrout, Bombay, and other places throughout Europe and Asia.

Financial Statement.

For a full statement of the revenue and expenditure for the different departments, see Appendix V at the end of this report.

Conclusion.

In conclusion, I may say that never before were we so well equipped for work in the different departments of the institution as at the present time. We have nearly all the buildings we require, and our class-room and laboratory appliances are sufficient for the number of students now in attendance. It may, before long, be necessary for us to increase our dormitory accommodation; and we shall have to provide a new building for the Experimental department.

JAMES MILLS,
President.

PART II.

REPORT OF THE

PROFESSOR OF NATURAL HISTORY AND GEOLOGY

To the President of the Ontario Agricultural College :

SIR,—I have much pleasure in presenting to you my annual report upon the department of Natural History in connection with the Ontario Agricultural College. The work has been engaged in with much more comfort than in any preceding year, on account of the excellent equipment at my disposal and the addition of an assistant to the department. At a time when so much stress is laid upon technical education, too much cannot be done to illustrate lectures by diagrams and objects. This demands much time in preparation, and consequently we had reached a period when help was required. The appointment of an assistant has enabled me to add to our collection of diagrams and specimens and carry on some experiments of service in elucidating the principles of science as related to plant life. For years we have been necessitated to teach Botany, Zoology and Geology theoretically rather than practically, and thus appealed largely to the *ears* of our students ; but to-day we are in a position to enlist their attention and impress our remarks by appealing to the *eyes* and even *hands*, and thus make impressions by a threefold application instead of one.

The inauguration of a Summer School at our College for teachers, with a view to prepare them to teach agricultural science in the schools of rural districts, was a new departure in College work, and one that added much work to the department of Natural History ; but the labor was entered upon with much pleasure, that was increased by the enthusiastic manner in which those who attended took up the work. We endeavored in this course to keep before us a line of instruction that would supply some of the most important *facts* bearing upon agricultural science and *how* to place them in a clear, simple and attractive manner before the average common school pupil.

The following is a synopsis of the work as it related to the department of Natural History :

Geology. Nine lectures illustrated by diagrams upon canvas ; views by a stereoptican and specimens in the museum. In this course a fair outline of the leading principles in geology was given and a general reference made to the geological systems in Ontario, so as to explain how soil has been formed ; its composition and the changes it is now undergoing. A consideration of the economic products of Ontario rocks also received some attention.

Botany. Ten lectures chiefly occupied in a study of injurious plants such as cause mildew, blight, smut, rust and "spot" on the apple ; the orders in which most of our weeds are found, and those from which we obtain grain, roots, forage and fruit. These lectures were fully illustrated by diagrams, lantern slides and specimens from the herbarium, together with the plants growing in our instructive plot containing upwards of 500 species, labelled and arranged systematically into orders, etc. Plants were brought into the class-room, analysed and identified by the class.

Entomology. Five lectures devoted chiefly to a discussion of the orders in which we find injurious insects, how to secure, mount and arrange insects in a collection; the use of insecticides and how to apply them.

Microscopy. This was followed in the afternoon as practical work, in which examination was made by microscopes of pollen, crystals, starch grains, plant, hairs, stomata, the various modifications of cells in the formation of tissue, smut, rust, plum-knot and mildews.

Field Days. A portion of three days was spent in field work; one trip to Elora, another to Rockwood, and an afternoon to an examination of the plants upon the lawn and in the greenhouses.

1. Museum.

During this year we have added to this room a collection of 100 weeds and their seeds. There has also been made a donation of five cases of insects by Edmund M. Jarvis, a former student. This is one of the best gifts we have as yet received for the museum, and has enabled the writer to arrange a collection of great service to the students in Economic Entomology. The arrangement consists of: 1. A group of characteristic insects in each order, those with biting mouths, sucking mouths and combined mouths being placed together. 2. The characteristic families of injurious and beneficial insects. 3. A miscellaneous grouping of typical forms.

P. R. McRitchie, of Maple Hill, donated specimens of petrified moss, stalactites, bog iron and petrified leaves.

2. Library.

Wonderful strides have been made in this division of work during the past ten years. It is not long since the volumes were among the hundreds, to-day we find they have reached about 6,000. With this rapid increase has come the need to be methodical in its management and the necessity of indexing the valuable reports received from various sources. At present my assistant is engaged upon this work a part of each day, the remainder being occupied in the botanical laboratory. Both officers and students have a much better opportunity now to consult books than formerly. The Library is open from 9 a.m. till 2 p.m. One hundred and fifty-two volumes have been added during the year; these may be grouped as follows:

Reports, chiefly agricultural	45
Botany	4
Geology	1
Agriculture	17
Chemistry	12
Literature	7
History	6
General Science	3
Parliamentary Reports	14
Biography	16
Poultry	3
Horticulture	15
Miscellaneous	9
	152

3. Reading Room.

This large, bright and cheerful room, well heated, equipped with tables, desks, etc., and well furnished with newspapers, journals and magazines, cannot fail to prove a most important factor in the education of our students. Here is placed before them the latest additions to knowledge, as applied to agriculture, and every convenience for its study and acquirement.

The following is a list of papers, journals and magazines which come to the College, and are for the use of the students in attendance:

(a) *Sent free by the Publishers.*

Name.	Where Published.
1. Journal of Commerce	Montreal.
2. Canadian Baptist	Toronto.
3. Christian Guardian	"
4. Canada Presbyterian	"
5. Monthly Weather Review	"
6. Presbyterian Review	"
7. Sheep Breeder and Wool Grower	Chicago.
8. Manitoba Weekly Free Press	Winnipeg.
9. Canadian Horticulturist	Grimsby.
10. Canadian Entomologist	London, Ont.
11. Bee Journal	Beeton.
12. North York Reformer	Newmarket.
13. Acton Free Press	Acton.
14. Ontario Evangelist	Erin, Ont.
15. Evangelical Churchman	Toronto.
16. Farmers' Review	Chicago.
17. Canadian Independent	Toronto.
18. Rural Home Journal	Kentucky.
19. Canadian Churchman	Toronto.
20. " Independent	"
21. " Evangelist	"
22. " Bee Journal	Brantford.
23. Poultry Journal	Beeton.
24 Farmers' Home	Ohio.
25. Farmers' Review	Chicago.

(b) *Furnished by the College.*

1. Daily Globe	Toronto.
2. " Mail	"
3. " Empire	"
4. " Mercury	Guelph.
5. " Herald	"
6. Rural Canadian	Toronto.
7. Grip	"
8. Poultry Review	"
9. Farmers' Advocate	London, Ont.
10. Canadian Stock Raisers' Journal	Toronto.
11. Nor'-West Farmer	Winnipeg.
12. Breeders' Gazette	Chicago.
13. North British Agriculturist	Edinburgh, Scotland.
14. American Garden	Greenfield, Mass.
15. Cultivator and Country Gentleman	Albany, N. Y.
16. Scientific American	New York.
17. Live Stock Journal	England.
18. American Dairyman	New York.
19. Botanical Gazette	Crawfordsville, Ind.
20. Agricultural Science	Geneva, N. Y.
21. Literary Digest	Boston.
22. Entomological News	Philadelphia.
23. Canadian Agricultural and Home Journal	Peterborough.
24. Hoard's Dairyman	Ft. Atkinson, Wis
25. Maritime Agriculturist	Sackville, N. B.
26 Science	New York.
27. Garden and Forest	"
28. Scientific American Supplement	"

4. Practical Work.

Much attention has been given to the identification of seeds and plants during this year in connection with the preparation of the bulletin on weeds in a subsequent part of this report. A plot was set apart for the purpose of observing the "struggle for existence" among plants; in this 125 species, chiefly weeds were sown and allowed full scope to grow, and will be permitted to do so for a time, in order that we may observe what species succeeds the best under these adverse conditions.

Plots were sown with smutty wheat; wheat dipped in a solution of *blue vitrol* and seed untreated. An examination of the wheat from these plots showed that the treated wheat had escaped injury from the smut, while the untreated was very smutty.

The solution referred to consisted of copper sulphate, 4 oz. dissolved in 6 gals. water, and the seed allowed to remain in it for 13 hours; after this it was put in limewater for 10 minutes A complete life history of the smut fungus is given by Prof. Fletcher in Bulletin III of the Central Experimental Farm, Ottawa, and by the writer in Bulletin LVI of the Ontario Agricultural College, in the College Report, 1890.

Considerable attention has been directed to the growing of rape of late years. There appears to be several varieties in the market, one of which (*bird rape*) at least is of little use as a forage plant. This is an annual, produces little foliage and runs to seed rapidly. *True rape*, a biennial, is very leafy, and therefore supplies an excellent succulent food in considerable quantity; but a variety much like this in the colour of its foliage has also been sold for *true rape*. This is also an annual with considerable stalk, which deteriorates its value for feeding purposes. It is thought this form is a hybrid between the *bird rape* and the *true rape*. With a view to testing this, we made an attempt to cross these types, but the plants used failing to flower about the same time, our plans were thwarted. In our experiment we had the plants near one another to see if hybridizing would result simply from proximity of the plants (for plants of the order *Cruciferas* cross very readily) and also some plants of both species at a distance for the purpose of artificial fertilization. This experiment will engage our attention again.

In connection with the department of Natural History much more spraying was done than in any former year, and with very satisfactory results.

Besides the general spraying followed in the orchard and garden, special trees were selected and experimented upon for the purpose of trying the efficacy of certain mixtures for specific insects and fungoid diseases.

The mixtures which seem to give the best results are found in the bulletin below, which is slightly changed in some cases from the first issue. The whole question of spraying is comparatively new, and we may expect to see changes in mixtures and methods of application from time to time. At present, experience indicates the following as worthy of application, and we have no doubt if the work is done *carefully* and *thoroughly* good results will follow.

REMEDIES FOR COMMON PLANT AND INSECT FOES.

So numerous have been the applications for Bulletin LXXIII, referring to some of the most common insecticides and fungicides, that it has been found necessary to prepare another bulletin (No. LXXXVIII) upon the subject. Reference will now be made not only to the mixtures commonly used, but also to the way of applying them against specific forms of plant and insect enemies.

Fungicides.

Fungicides may be defined as chemical compounds or mixtures used for the purpose of destroying such injurious forms of plant life as live upon other plants by

absorbing their juices, whereby they affect their vitality. The *rusts*, *smuts*, *mildews* and *blights* are examples of such parasitic forms of plant life. Among the most common fungicides are the following :

Bordeaux Mixture. There are various forms of this mixture, the following being most commonly used :

(1) Consists of 5 lb. of copper sulphate, 4 lb. lime and 45 gals. of water. This may be prepared as follows : Dissolve the copper compound in sixteen gals. of water ; slake the lime in 6 gals. of water, and when the latter is cooled pour it into the copper solution and mix thoroughly, and add the remainder of the water. Pulverized copper will dissolve readily. It is an improvement to strain the lime through some kind of coarse material.

(2) A modified form is made by taking 4 lb. of copper sulphate, 4 lb. lime and 50 gals. of water (Green's formula.)

(3) Another form is made by taking 6 lb. of copper sulphate, 4 lb. of lime and 50 gals. of water (Weed's formula.)

These diluted mixtures have been proved to be very successful, and are now commonly used. An advantage is gained by using Bordeaux mixtures, since Paris green may be added so as to combine insecticide and fungicide. So far experience indicates the Bordeaux mixture to be one of the best fungicides known.

Eau Celeste. Consists of 2 lb. of copper sulphate, 1 quart of ammonia and 50 gals. of water. Dissolve the copper sulphate in 2 gals. of hot water ; as soon as cool add the 1 quart ammonia and dilute the 50 gals.

A modified form has been very successful, viz. : 2 lb. copper sulphate dissolved in 2 gals. of water, 2½ lb. of sodium carbonate (washing soda) dissolved in another vessel. Mix these, and when chemical action has ceased, add 1 quart of ammonia and dilute to 50 gals.

Copper Sulphate. 1 lb. copper sulphate in 25 gals. of water ; spray early upon vines, etc., before leaves appear.

Ammoniacal Solution of Copper Carbonate. Dissolve 6 oz. of copper carbonate in 2 quarts of ammonia, and when about to use dilute it to 50 gals.

Potassium Sulphide. Consists of 1 oz. potassium sulphide to 2 gals. of water.

Insecticides.

These are compounds or mixtures used to destroy insects injurious to vegetation.

Paris Green. (Arsenite of copper, containing 50-60 per cent. of arsenic.) This is applied dry or in solution. In the dry form it should be mixed with 50 to 100 parts of plaster, wood-ashes, flour or air slacked lime, and dusted upon the affected plants. The form in solution is usually 1 lb. of Paris green to 200 gals. of water, but if the foliage is tender 250 to 300 gals. of water may be used. This is the usual strength applied upon the plum and peach. As the green powder does not dissolve it requires to be kept thoroughly mixed by constant stirring. 1 lb. of lime to every 50 gals. will prevent injury to the foliage.

London Purple. This is an arsenite of lime obtained as a by-product in manufacturing dyes. It is largely used instead of Paris green ; but being more soluble in water it is not apt to injure the foliage, and, besides, its composition varies considerably so that when used it is not likely to give as uniform results as Paris green.

These arsenites are excellent against all leaf-eating insects.

Kerosene Emulsion. This is a mixture of coal oil and water. There are three formulas used to a considerable extent :

(1) *Riley-Hubbard Emulsion.* Consists of ½ lb. of hard soap in 1 gal. of water. Boil till dissolved, and then add 2 gal. of coal oil, and mix thoroughly for about five

minutes. When properly mixed it will adhere to glass without oiliness. This can be done by forcing it through the nozzle of a force-pump repeatedly until the mixture appears complete. It will then form a creamy mass which thickens into a jelly-like substance on cooling. In using, dilute with 9 parts of soft water. This form is very commonly used and is easily prepared. If the foliage is very tender the emulsion must be more dilute 15-20 parts water.

(2) *Cook's Emulsion* (soft soap). Take 1 quart of soft soap and 2 quarts of boiling water, and while hot add 1 pint of coal oil; mix thoroughly as above. In using dilute with an equal amount of water, either hard or soft.

(3) *Cook's Emulsion* (hard soap). Take $\frac{1}{4}$ lb. of hard soap, 2 quarts of hot water and 1 pint of coal oil; thoroughly mix while hot. In using dilute with twice the amount of either hard or soft water.

Emulsions are successful against plant lice and scale insects.

Hellebore. This is the powdered root of a plant (Veratrum album). It may be applied dry, or in solution at the rate of 1 oz. to 3 gals. of water.

Pyrethrum. Made from the powdered flowers of the genus pyrethrum, a plant of the sunflower family. It should be fresh, and hence ought to he kept in closed vessels. It may be used in dry form, 1 part pyrethrum to 5 or 8 parts of flour, or in liquid form in the proportion of 1 oz. in 3 gals. of water.

Carbolic Acid Emulsion. Consists of 1 part carbolic acid to 7 parts of a solution consisting of 1 quart of soft soap or 1 lb. of hard in 2 gals. of water.

Tobacco. The refuse from cigar factories is good, either dusted or in the form of a powder, or used as a solution in the proportion of 1 lb. in 2 gals. of water.

Whale Oil Soap. This may be used in the proportion of 2 oz. of soap to 1 gal. of water.

Alkaline Wash. A strong solution of washing soda mixed with soft soap until about as thick as paint.

Carbolized Plaster. Consists of 1 pint of carbolic acid and 50 lb. of land plaster.

Combined Mixtures. By the combination of an insecticide with a fungicide we are able at the same time to cope with injurious insect and plant life. A good example of this can be seen in the application of a combined mixture to potatoes, in which case the beetle may be destroyed and the blight prevented. While combatting the "spot" of the apple the codling moth may also be fought, if a combined mixture be used.

(1) 6 oz. of Paris green added to Bordeaux mixture (No. 1, 2 or 3) makes an excellent combination.

(2) The following is also recommended: 2 oz. of Paris green and 2 oz. of copper carbonate dissolved in 3 pints ammonia, $\frac{1}{2}$ lb. of lime added to 32 gals. of water, and the whole thoroughly mixed. It is necessary to add the lime, or the foliage will be damaged.

Precautions in Spraying.

1. Keep poisons labelled and out of the way of children.
2. Do not spray so far into the season as to affect the fruit.
3. In making emulsions remember the inflammable nature of coal oil.
4. *Never spray trees in bloom.*
5. Try solutions on a small scale if likely to injure foliage, and watch results.
6. Be careful and thorough in your work.

Careful analyses show that there is no ground for alarm regarding the effect of spraying fruit trees with Paris green.

The foregoing mixtures are usually applied by spraying machines which can be procured through any responsible seedsman. As copper compounds act upon tin and iron, it is well to prepare such mixtures in earthen, wooden or brass vessels.

The Bordeaux mixture is rather dirty to work with, and inclined to clog the jet. Nevertheless it is about as effectual a fungicide as has yet been discovered. If used too long in the season it is apt to affect the appearance of the fruit. This can, however, be washed off with a dilute solution of vinegar.

General rules in spraying :

1. Early treatment with copper sulphate, 1 lb. in 25 gals. of water. Apply before buds start.

2. Bourdeaux mixture once before blossom.

3. Again when fruit sets, and two or three times after at intervals of 12-15 days. Much depends upon early applications. All affected material should be destroyed.

Cost of the Mixtures. A fair idea of the cost of the various mixtures may be had upon an examination of the following price list of substances used in the different formulas :

Ammonia,	25c. per lb.	Pyrethrum,	40c. per lb.
Copper carbonate,	60c. per lb.	Copper sulphate,	12c. per lb.
Paris green,	30c. "	Hellebore,	25c. "
London purple,	15c. "	Sodium carbonate,	5c. "

Remedies for Certain Injurious Fungi.

1. *Apple Spot.* (1) Spray with Bordeaux mixture, making first application in spring before the blossoms open. Spray again as soon as the fruit is well formed. Now add 4 oz. of Paris green to the barrel and make three applications at intervals of two weeks. These last applications will destroy insects as well as the spores of the "spot" fungus.

(2) Copper carbonate ammoniacal solution referred to and Eau Celeste are also good remedies. With these the first application should be made previous to blossoming, the second when the fruit is about the size of peas, and the third two or three weeks later.

2. *Brown Rot* of plum, cherry and peach. Use the Bordeaux mixture in the same way as for apple "spot." Burn all affected fruit and leaves in the fall. If "rot" should set in make one or two sprayings with copper carbonate solution.

3. *Pear Leaf Blight*, which appears on both leaves and fruit, giving the leaves a spotted appearance and causing the fruit to crack.

(1) Spray with ammoniacal solution of copper carbonate as soon as the leaves begin to open, and repeat two or three times at intervals of two weeks.

(2) Use Bourdeaux mixture as for apple "spot."

4. *Strawberry Leaf Blight.* Spray during July and August, every two weeks, with the following solution : 4 oz. of copper carbonate and two quarts of ammonia in a barrel of water.

5. *Gooseberry Mildew.* Spray with 1 oz. of potassium sulphide in two gallons of water. Begin as soon as the leaves are opening, and repeat about every three weeks.

6. *Grape Blights.* Spray as follows :

(1) Spray vines before buds start with the copper sulphate solution, 1 lb. to 25 gals. water.

(2) Spray with Bordeaux mixture when shoots are about 6 inches long.

(3) Spray again just before blossom.

(4) Spray again in 15 days after.

(5) Again in 20 days.

These applications will be effective against the various fungoid diseases of the grapes, *Black Rot*, *Downy Mildew* and *Powdery Mildew.*

Grape Downy Mildew. Spray with Eau Celeste about ten days before blossom; give another application as soon as the berries are set, and a third about three weeks later. No 6 includes this disease.

8. *Raspberry Anthracnose.* (1) Spray early with copper sulphate, 1 lb. in 25 gals. water.

(2) Spray with Bourdeaux mixture two or three times during the summer.

9. *Potato Blight.* Apply Bourdeaux mixture (No. 2) three or four times, administering the first when the plants are about six inches high If $\frac{1}{2}$ lb. of Paris green be added to the mixture, beetles may also be destroyed as soon as they appear.

10. *Smut.* (1) Immersing seed in hot water of 135° Fahr., for five minutes, will destroy the spores of smut. 5° above or below that point will likely fail.

(2) Put 1 lb. of copper sulphate in 20 gallons of water and allow the seed to remain in this for about 15 hours; then put the seed for 10 minutes in lime water made by slaking the lime in ten times its weight of water.

11. *Black Knot.* (1) Cut off affected limbs and destroy them.

(2) Cut out knot and paint with a mixture of turpentine and lime. If sulphate of copper solution is applied to the knot before painting, the treatment is more effective.

Remedies for some Common Injurious Insects.

1. All *Leaf eating* insects, such as canker worms, tent caterpillars, grape flea beetle, Tussock moth, fall web-worm, etc., are readily destroyed by spraying with Paris green, 1 lb. to 200 gals. of water.

2. *Borers* of the apple tree trunk and peach can be overcome by applying late in May or early in June to the trunks and large branches the following solution: 1 quart of soft soap or 1 lb. of hard soap in 2 gallons of water; heat to boiling point and add 1 pint of crude carbolic acid. It is well to scrape off the rough bark first, and then rub the mixture well on.

3. *Bark Lice.* Scrape off the bark during the winter and early spring, and rub on a solution made by adding one part of crude carbolic acid to 7 parts of a solution of soft soap 1 quart, or hard soap $\frac{1}{4}$ lb. in 2 quarts of boiling water. As soon as the young lice are hatched and begin to move (about June) spray the tree with a kerosene emulsion.

4. *Codling Moth*, or apple worm. As soon as the petals have fallen, spray with a solution of 1 lb. of Paris green in 200 gallons of water; ten days later give a second application, and if necessary a third spraying may be given later on.

5. *Plum Curculio.* Spray with 3 oz. of Paris green to 50 gallons of water as soon as the blossoms have fallen, and give two more applications at intervals of about ten days. Jarring the trees and collecting the insects as they fall upon sheets is also much followed.

6. *Bud Moth.* This insect destroys the flower bud of plums, pears and apples. Spray with ordinary Paris green mixture when the buds begin to swell, and again in about ten days, that is, before the blossoms open. Kerosene emulsion is also recommended.

7. *Pear and Cherry Tree Slug.* Spray with either Paris green, hellebore or pyrethrum. Paris green in the proportion of 1 lb. to 250 gallons of water may be used for both broods if the trees are not bearing; otherwise use the Paris green for the second and either of the other remedies for the first brood.

8. *Potato Beetle.* Spray the vines with Paris green, using 6 oz. to 50 gallons of water.

9. *Squash Bug.* The young ones can be destroyed with kerosene emulsion; but those matured require to be hand-picked or caught under pieces of board placed among the plants where the bugs collect at night.

10. *Cucumber Beetle.* Cover the plants with netting so as to keep the beetles off.

11. *Plant Lice.* Use kerosene emulsion.

12. *Pea Weevil.* (1) Sow unaffected peas. (2) Heat affected peas as soon as gathered for 1 hour at a temperature of 145°. (3) Immerse affected seed peas in hot water, adding almost at once cold water, and leave for 24 hours.

13. *Strawberry Slug.* Spray the first brood with pyrethrum and the second with Paris green.

14. *Currant Worm.* Spray with hellebore 1 oz. to 3 gallons of water.

15. *Onion and Cabbage Maggots.* Use kerosene emulsion, and apply it in the vicinity of the plants. Carbolic emulsion has been very successful against the "radish maggot."

16. *Turnip Flea Beetle.* Dust upon the attacked plants while the dew is still on them, 1 part of Paris green and 50 parts of land plaster. Tobacco dust is also effectual.

17. *Ground Cutworms*, etc. (1) Surround the stem of the plant with heavy paper. (2) Sprinkle Paris green upon small bunches of fresh clover, and then scatter them about where the worms are working. They will serve as baits and poison many of the worms.

18. *Common Cabbage Worm.* Spray with a solution of 1 oz. of pyrethrum in 4 gallons of water. Kerosene emulsion may also be used on young plants.

In order to make this bulletin as concise and simple as possible, many remedies have been omitted, and only the most successful noted. No description has been given, and only the common names of injurious plants and insects referred to have been used, as being sufficient for practical purposes. If further information is required, it will be readily given on application to the writer.

WEEDS OF ONTARIO.

For some time past the writer has been collecting information regarding the weeds of Ontario with special reference to their distribution in the Province. Having received replies from over one thousand persons to whom circulars were sent through the medium of the Bureau of Industries asking for the names of the ten worst weeds in the district, he is able to give in this bulletin a summary of the information received.

Weeds of late years have received considerable attention not only from students of botany but also from practical agriculturists, a fact which indicates that farmers are advancing and that they are departing from careless methods of cultivation, and adopting systems in which cleanliness of the field forms an important factor. In fact they are now convinced that weeds must be classed with such enemies as parasitic plants and insects.

Insects, mildews, blights, etc, were early condemned as sources of loss, but farmers have been slow to consider that much loss could be sustained by growing weeds. However, they see now that weeds involve extra labor, smother useful plants, take food from the soil, add impurities to the grain, rob the soil of moisture, afford shelter and food to injurious insects, and give fields an unsightly appearance.

In Bulletin LXXXV the principles which underlie a successful warfare against weeds were thoroughly discussed, and reference was made to the best methods of destroying the following eleven varieties: Canada Thistle, Sow Thistle, Wild Flax, Pigeonweed, Ragweed, Couch Grass, Ox-eye Daisy, Burdock, Blueweed, Mustard and Wild Oat. In this bulletin we give a description of four additional weeds which, though not so common, may soon become pests.

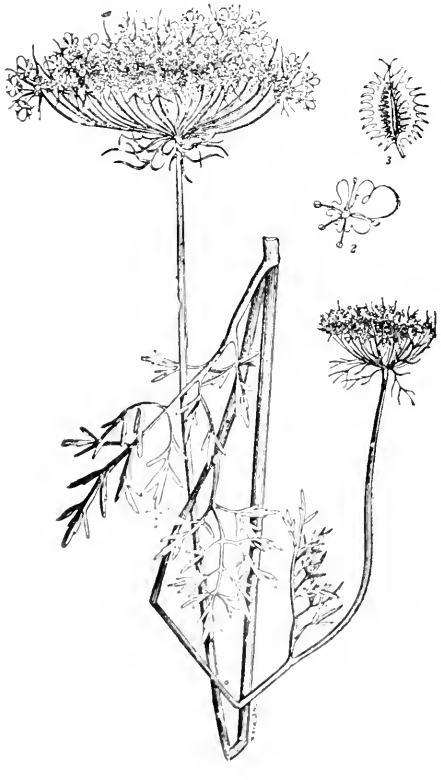
In examining the various lists we find reference made to 92 species, embracing 76 genera and 28 orders. Only a few observers refer to certain forms, but in order to give some idea of the number of plants considered as weeds, a tabulated statement is given which will be useful for showing in a concise form the weeds of Ontario.

So varied are the names given to some weeds that the writer in several cases had to secure the seed and grow the plant or get the plant itself before the local name reported could be understood. Taking the names given in the 1,015 replies we find the 25 following weeds are ranked as the worst, the figures given indicating the number of persons who gave the above in their list of the 10 worst weeds:

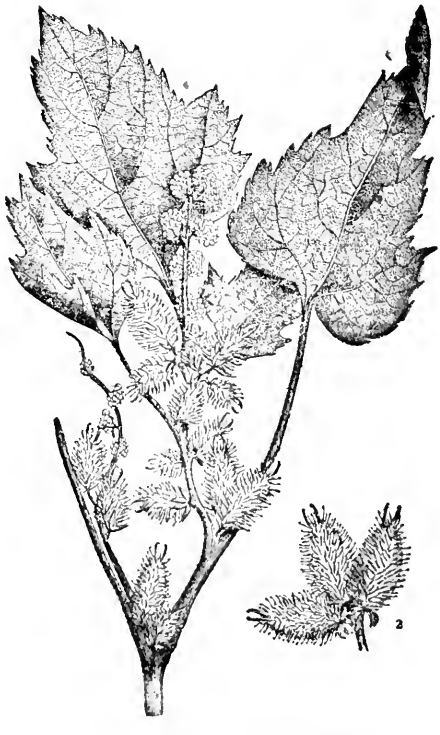
Canada Thistle	1,015	Foxtail	152
Mustard	666	Pigweed	126
Wild Oat	472	Black Bindweed	112
Ox-eye Daisy	463	Milkweed	98
Burdock	439	Sorrel	92
Couch Grass	401	Purslane	82
Ragweed	303	Blueweed	79
Wild Peas	288	Mullein	69
Cockle	241	Mayweed	60
Dock	232	Lamb's Quarters	55
Redroot	217	Sow Thistle	50
Bur	212	Bindweed	46
Wild Flax	173		

Wild Carrot.

The Wild Carrot (*Daucus Carota*) is a degraded form of the cultivated carrot and like it, is biennial. It grows about two or three feet high and bears many flower clusters



Wild Carrot (*Daucus Carota*).



Clot-bur (*Xanthium Canadense*).

which, as they mature, form a sort of bird-nest structure with each umbel. Being a biennial it cannot survive long where thorough cultivation is carried on, and hence is most frequently found along roadsides, railway tracks, etc. Hand pulling and destroying

as fast as it reaches flower will be effective. Spudding a few inches below the surface will kill it, but cutting it at the surface has a tendency to make it increase the number of its branches.

Clot-bur.

Clot-bur (*Xanthium Canadense*) is a large coarse annual reported from the western part of the province. It bears some resemblance to the burdock in having large coarse leaves and the seed in a bur. The bur is oval, about an inch long and covered with stiff hooked prickles. Like Ragweed it has two kinds of flowers—staminate at the summit in spike clusters and pistillate below. The plant is about three feet high. *Xanthium Spinosum*, a very thorny form, is found in the vicinity of Dundas, but it is more confined to the Southern States where it is a very obnoxious weed.

Dodder.

The Dodder (*Cuscuta Trifolii*) is a parasitic plant, an annual which is found twining around the stem of clover. Some specimens were received for identification from the vicinity of Drayton. The seeds of the Dodder are sometimes found among clover seed. When these are sown they germinate and reach the clover plants around which they twine and send out from all parts of their stem rootlets that penetrate the clover stems and absorb sap from them and soon weaken the plants upon which they grow. The Dodder stem as soon as it gets a firm hold of the clover breaks away from the seed from which it started and lives entirely upon the clover as a regular parasite. When found

Dodder (*Cuscuta Trifolii*).

Penny Cress (*Thlaspi Arvense*)

attacking clover the plants affected should be removed. It is easily recognized as a yellow, leafless, string-like plant, twining around the clover. Care should be exercised to sow clean clover seed. Dodder seeds though similar to clover seed are smaller and may be screened. In Europe this parasite is often injurious. The specimens which have come

under the writer's observation were attached to stems of lucerne in one case and clover in another; the latter were sent from the vicinity of Drayton and it would appear that this weed is being introduced into some parts of the province. Every precaution should be taken by farmers to prevent its distribution.

Penny Cress.

Penny Cress (*Thlaspi Arvense*) is not yet a common weed in our province, but we may reasonably expect to find it get a firm foothold if its approach is not carefully guarded. It is very common in the Red River valley of Manitoba where it is called the French weed, and as much wheat is being imported from that country this plant will certainly come in the seed. Already it has been found in several parts of Ontario. It belongs to the mustard family, and like the other members of it, produces many seeds which are endowed with much vitality. The pods of this plant are very characteristic, being somewhat circular and flat with a distinct notch at the top. The leaves are oblong, arrow shaped at the base, toothed and smooth. It bears very small white flowers. It is an annual, about one foot high and emits a strong somewhat offensive order when bruised. The method followed in destroying mustard may be adopted to get rid of this pest and exercise vigilance to keep it from getting a foothold. The accompanying cut will prove useful in identifying this new-comer.

Tumbling Weed.

Another weed that we may expect from the west is known as Tumbling Weed (*Sisymbrium Sinapistrum*), also a member of the mustard family. It is reported by Prof. Fletcher as common around Indian Head, N. W. T. This annual is about two feet high, bears many pods, each well filled with small round brown-colored seeds. It matures its seed about the same time as mustard. Great care should be taken to prevent the plant getting a foothold in Ontario. It is not a native of the Northwest Territory but seems to have been introduced there. It is a native of Europe.

In the following tabulated list of weeds we find the Mustard family supplies 7; Pink, 6; Bean, 5; Sunflower or Composite, 22; Figwort, 4; Bur, 4; Mint, 3; Buckwheat, 6, and the Grass, 6. The other orders or families are represented by only one or two forms.

A Tabulated List of the most common Weeds in Ontario.

Order.	Scientific Name.	Common Name.	
Ranunculaceæ	Ranunculus acris	Buttercup	P
"	Ranunculus sceleratus	Cursed Buttercup	A
Cruciferæ	Camelina sativa	False Flax	A
"	Capsella Bursa-pastoris	Shepherd's purse	A
"	Lepidium Virginicum	Pepperwort	A
"	Thlaspi arvense	Pennycress	A
"	Brassica Sinapistrum	Wild mustard	A
"	Sisymbrium officinale	Hedge mustard	A
"	Erysimum cheiranthoides	Worm seed mustard	A
Papaveraceæ	Chelidonium majus	Celandine	P
Hypericaceæ	Hypericum perforatum	St. John's wort	P
Caryophyllaceæ	Lychnis Githago	Corn Cockle	A
"	Lychnis vespertina	White Cockle	B
"	Silene inflata	Bladder Campion	P
"	Cerastium arvense	Field Chickweed	P
"	Saponaria officinalis	Bouncing Bet	P
"	Stellaria media	Chickweed	A
Portulacaceæ	Portulaca oleracea	Purslane	A
Malvaceæ	Malva rotundifolia	Mallow	P
Anacardiaceæ	Rhus venenata	Poison Sumach	P
"	Rhus toxicodendron	Poison Ivy	P
"	Rhus radicans	Climbing Ivy	P

Note.—A is for annual, B for biennial and P for perennial.

Order.	Scientific name.	Common name.	
Leguminosæ	Trifolium arvense	Rabbit-foot clover	A
"	Vicia Cracca	Wild Tare	P
"	Medicago lupulina	Black Medick	A
"	Melilotus alba	Sweet clover	A
"	Melilotus officinalis	Yellow Melilot	A
Umbelliferæ	Daucus carota	Wild Carrot	B
"	Conium maculatum	Poison Hemlock	B
"	Pastinaca sativa	Wild Parsnip	B
Onagraceæ	Œnothera biennis	Evening Primrose	B
"	Epilobium angustifolium	Willow-herb	P
Crassulaceæ	Sedum acre	Mossy Stone crop	P
Dipsaceæ	Dipsacus sylvestris	Teasel	B
Compositæ	Senecio vulgaris	Groundsel	A
"	Ambrosia artemisiæfolia	Ragweed	A
"	Leucanthemum vulgare	Ox-eye Daisy	P
"	Achillea millefolium	Yarrow	P
"	Tanacetum vulgare	Tansy	P
"	Solidago Canadensis	Golden Rod	P
"	Rudbeckia hirta	Cone-Flower	B
"	Centaurea Cyanus	Bluebottle	A
"	Sonchus oleraceus	Sow Thistle	A
"	Sonchus arvensis	Corn Thistle	P
"	Erechthitis hieracifolia	Fireweed	A
"	Arctium Lappa	Burdock	B
"	Cichorium Intybus	Chichory	P
"	Taraxacum officinale	Dandelion	P
"	Erigeron Canadense	Fleabane	A
"	Anthemis Cotula	Mayweed	A
"	Anthemis arvensis	Field Chamomile	A
"	Cnicus arvensis	Canada Thistle	P
"	Cnicus lanceolatus	Bull Thistle	B
"	Bidens frondosa	Bur Marigold	P
"	Inula Helenium	Elecampane	P
"	Xanthium Canadense	Clot-bur	A
Scrophulariaceæ	Verbascum Thapsus	Mullein	B
"	Veronica arvensis	Speedwell	A
"	Veronica peregrina	Neckweed	A
"	Linaria vulgaris	Toad Flax	P
Verbenaceæ	Verbena hastata	Vervain	P
Labiatæ	Leonarus Cardiaca	Motherwort	P
"	Nepeta Cataria	Catnip	P
"	Brunella Vulgaris	Self-heal	P
Borraginaceæ	Echinospermum Lappula	Stickseed	B
"	Cynoglossum officinale	Hound's Tongue	B
"	Echium vulgare	Blueweed	B
"	Lithospermum arvense	Pigeonweed	A
Solanaceæ	Datura Stramonium	Thorn Apple	A
"	Physalis viscosa	Ground Cherry	P
Convolvulaceæ	Convolvulus arvensis	Bindweed	P
"	Cuscuta trifolii	Dodder	A
Asclepiadaceæ	Asclepias Cornuti	Milkweed	P
Plantaginaceæ	Plantago major	Plantain	P
"	Plantago lanceolata	Rib-grass	P
Chenopodiaceæ	Chenopodium album	Lamb's Quarters	A
"	Chenopodium capitatum	Strawberry Blite	A
Amarantaceæ	Amarantus retroflexus	Pigweed	A
Polygonaceæ	Polygonum aviculare	Goose Grass	A
"	Polygonum Convolvulus	Black Bindweed	A
"	Polygonum Persicaria	Lady's Thumb	A
"	Rumex Acetosella	Sorrel	P
"	Rumex crispus	Common Dock	P
"	Rumex obtusifolius	Bitter Dock	P
Urticaceæ	Urtica dioica	Nettle	P
Liliaceæ	Allium tricoccum	Wild Leek	P
Gramineæ	Bromus secalinus	Chess	A
"	Setaria glauca	Foxtail	A
"	Panicum Crus-galli	Barnyard Grass	A
"	Panicum capillare	Witch Grass	A
"	Avena fatua	Wild Oat	A
"	Agropyrum repens	Couch Grass	P
28 orders.	76 genera.	92 species.	

5. *Meteorology.*

The oversight of this work has been connected with the department of Natural History; but it is hoped some arrangement will be made by which it can by transferred to the Experimental, to which it now more properly belongs.

Observations are regularly taken at the hours of 8 a.m and 8 p.m. daily, and recorded in a book printed for the purpose. The instruments in use are as follows:

Barometer—Showing the atmospheric pressure at the time of observation.

Maximum thermometer—Indicating the highest temperature between times of observation.

Minimum thermometer—Indicating the lowest temperature between times of observation.

Pluviameter—Used in measuring the rainfall.

Thermometer—for observing ordinary temperature.

Besides taking observations from these instruments, the cloudiness of the sky is observed, and general remarks on the weather for the day are recorded in the daily register. At the close of each month a summary of the month's observations is made out. From these summaries the statement of the year's meteorology is made.

I am much indebted to the Minister of Agriculture for the liberality he has shown in furnishing us with the means by which we are able to increase our facilities to make the department of Natural History instructive, attractive and practical.

Your obedient servant,

J. HOYES PANTON,
Professor of Natural History.

Ontario Agricultural College,
December 31st, 1893.

PART III.

REPORT OF

THE PROFESSOR OF CHEMISTRY.

GUELPH, December 30th, 1893.

To the President of the Ontario Agricultural College:

SIR,—In submitting to you my report of the department of Chemistry, I beg to thank you for several improvements that have been made in this laboratory. I refer particularly to the slight changes in the heating arrangements by which my office and the smaller analytical room have been made comfortably warm, to the inside shutters put up on the windows of these two rooms, and to the desk and book shelving in the office. The above rooms, which were cold in winter and uncomfortably warm in the summer, are now comfortable during both cold and warm weather. Since fitting up the book-shelving, the chemical library has been increased, and the College and Experiment Station reports and bulletins have been re-arranged and classified.

LECTURES.

Under this heading several changes have been made. The experimental lectures in inorganic chemistry to the first year, will be continued through the fall and winter terms. Instead of taking organic chemistry in the first year, it has been made a second year subject. Practical chemistry, with your approval, will be made a first year subject and taken in the spring term. Lectures in agricultural chemistry will be commenced immediately after the course in organic chemistry closes, and these lectures will be continued through the winter and spring terms. By this arrangement of the subjects, analytical chemistry will be introduced in the first year, and immediately after the course of elementary, experimental lectures closes; organic chemistry will receive more attention than when it was a first year subject, and agricultural chemistry will be studied in the winter term when students feed and handle stock, and in the spring term when they can observe the crops growing, the effects of manures, etc.

TEXT-BOOKS.

Elementary chemistry by Remsen is the text-book of the first year. I beg to recommend that for the second year the first half of Remsen's "Chemistry of the Carbon Compounds," and for the third year all this book and the "Advanced Course" by the same author be prescribed.

CHEMICALS.

Until this year, third year students have paid a laboratory fee of $15, $5 going for gas and $10 for chemicals. This arrangement was not satisfactory. The students having no inducements to economise, used unneceesarily large quantities of chemicals, and therefore the annual grant for chemicals was frequently insufficient. This year, with your permission, no fee was charged for chemicals, but every student has been required to pay in advance for the chemicals he uses. In this way it costs the laboratory far less to supply chemicals, and it need not cost the students more than has been paid other years. I would, therefore, recommend that, instead of charging a fee, students be required to pay for the chemicals they use.

ANALYSIS OF FODDER CORN.

Testing six promising varieties of corn was one of the twelve experiments conducted by the Agricultural Committee of the Experimental Union during 1892. The seed was distributed from the station by the secretary of the committee, who mailed samples to every farmer expressing a wish to join in that experiment. Twenty out of the number sent in full returns of the results to the secretary. By this arrangement the varieties were tested in a great many different sections of country, including the following counties and districts: Huron, Bruce, Simcoe, Lambton, Grey, Kent, Elgin, Middlesex, Norfolk, Dufferin, Peel, Welland, Lincoln, Dundas, Prince Edward, Frontenac, Grenville, Northumberland, Muskoka and Parry Sound. At this station the same varieties were tested, and the samples grown here were analysed to determine their relative feeding value. Following are the average yields of tests:

Varieties.	Average yield per acre of 20 Ontario returns.	Guelph Experiment Station.	
		Yield.	Maturity.
	tons.	tons.	
Mammoth Southern Sweet (dent)	19.3	22.6	Late.
Thoroughbred White Flint	18.6	19.8	"
True Leaming (dent)	17.3	19.6	Late medium.
Mammoth Cuban (dent)	16.1	19.1	Medium.
Wisconsin Earliest White Dent	15.7	17.8	Medium early.
Compton's Early (flint)	11.8	13.8	Early.

In every variety the station yield is a little more than the average of the twenty Ontario returns, yet by arranging the varieties according to yield, both are in the same order. The relative yield, however, does not necessarily agree with the relative feeding value per acre of the crops. This is determined by amount of crop, degree of maturity of the product, and percentage composition.

DEFINITIONS.—*Ash* is the part of the fodder which remains unconsumed by burning to whiteness at the lowest possible red heat. *Crude Protein* is the muscle formers collectively. *Crude Fat* is a mixture of oils, wax, coloring matters, etc.; linseed oil is a common example. *Crude Fibre* is the woody portion of fodder. *Nitrogen-free Extract* is a mixture of substances commonly called carbo-hydrates; starch and sugar are examples. *Nutrient* is any substance that nourishes. Fat, protein, starch, etc., are nutrients.

Every variety was planted May 28th and cut September 17th. It would, therefore, follow that the late maturers, as Mammoth Southern Sweet and Thoroughbred White Flint, had not reached the same degree of maturity at the time of cutting as Compton's Early, an early maturing variety; and since the proportion of water decreases with maturity, a higher per cent. of water would be expected in the later than in the early maturers. Compton's Early contained 73.67 and Thoroughbred White Flint 84.16 per cent. of water. Early maturity and a low proportion of water are found in the same variety, while late maturity and a high per cent. of water occur together. Excepting Mammoth Southern Sweet, these varieties intermediate in maturity are also intermediate in per cent. of water. These facts alone indicate that an early maturing corn is a good ensilage corn. For ensilage purposes, heavy yielders are desirable; but to make sweet, nutritious ensilage, varieties that reach a good degree of maturity in any particular locality must be grown.

The figures in the second column, under fresh material, show a great difference in the amount of crude fat contained. Excepting .29, the average in Compton's Early, and .51, the average in Mammoth Southern Sweet, the higher fat percentages are found in the dryer and earlier maturing varieties.

TABLE OF COMPOSITION.

Varieties.		In Fresh Material.						Calculated to Water-free Substance.				
		Water.	Ash.	Crude Protein.	Crude Fibre.	Nitrogen-free Extract.	Crude Fat.	Ash.	Crude Protein.	Crude Fibre.	Nitrogen-free Extract.	Crude Fat.
Mammoth Southern Sweet	I	. . .	.80	.75	5.13	.....	.52	4.15	3.92	26 55	.....	2 69
	II	.....	79	.73	5.13	..	.50	4.13	3.81	26.61	.....	2.62
	Average.	80.70	.79	.74	5 13	12.13	.51	4.14	3.86	26.58	62 77	2.65
Thoroughbred White Flint	I	.....	.64	.69	4 07	.....	.26	4.03	4.42	25.66	.....	1.63
	II	...	.65	.69	4.06	... ..	.21	4.14	4.36	25.66	....	1.85
	Average.	84.16	.64	.69	4.06	10.22	.23	4.08	4.39	25.66	64.13	1.74
Wilson's True Leaming	I	.....	.78	.91	4.40	....	.41	4 04	4.72	22.71	..	2.11
	II	.....	76	.89	4.50	..	.46	3.97	4.60	23 71	....	2.27
	Average.	80.67	.77	.90	4.45	12.78	.43	4.01	4.66	23.24	65.90	2.19
Mammoth Cuban	I	. . .	.68	.91	4.38	..	.33	3.62	4.67	23.20	....	1.76
	II	.....	.67	.91	4.56	.....	.42	3.56	4.67	24.11	.....	2.21
	Average.	81.10	.67	.91	4.47	12.48	.37	3.59	4.67	23.65	66.11	1.98
Wisconsin Earliest White Dent	I	.....	.64	.89	3.94	....	.38	3.53	4.71	21.74	.....	2.11
	II	. . .	.66	.88	4.21	...	...	3.64	4.67	23.22	.....	.....
	Average.	81.89	.65	.89	4.08	12.11	.38	3.58	4.69	22.48	67.14	2.11
Compton's Early	I	.....	.91	1.16	5.07	.....	.30	3 46	4.42	19.35	....	1.14
	II	....	.96	1.19	4.92	.....	.29	3.65	4.54	18.66	.....	1.11
	Average.	73.67	.93	1.17	5.00	18.94	.29	3.55	4.48	19.01	71.84	1.12
*126 American Analyses	Max	93.60	2.58	4.03	11.40	36.31	1 59	13 8	18.2	39.2	72.9	6.7
	Min	51.50	.55	.54	1.90	3.01	.08	2.9	2 8	11.2	39.4	.6
	Average.	79.33	1 16	1.82	4.98	12.17	.54	5.6	8.8	24.1	58.9	2.6

*Including a great many varieties.

While the proportion of crude fibre is nearly the same in most of the varieties, it is relatively high in Compton's Early and Mammoth Southern Sweet. Probably the high degree of maturity in the former, and the natural deficiency of great leaf growth in the latter, account for the high per cent. of fibre.

Compton's Early, in the fresh condition, is considerably richer in protein than the other varieties. Mammoth Southern Sweet and Thoroughbred White Flint are relatively lower in protein, both in the fresh material and water-free substance.

It is interesting to observe, under the water-free substance, the regular increase in the proportion of nitrogen-free extract (starch and sugar) with the degree of maturity.

NUTRIENTS CALCULATED TO POUNDS PER ACRE.

Varieties.	Protein.	Fibre.	Nitrogen-free Extract.	Fat.
Mammoth Southern Sweet	334.48	2,318.76	5,482.76	230.52
Thoroughbred White Flint	273.24	1,607.76	4,047.12	91.08
True Leaming	253.70	1,748.85	5,022.54	168.99
Mammoth Cuban	347.62	1,707.54	4,767.36	141.34
Wisconsin Earliest White Dent	316.84	1,452.48	4,311.16	135.28
Compton's Early	322.92	1,380 00	5,227.54	80 04

This table gives the number of pounds of the several nutrients contained in the total crop of one acre for the different varieties. The numbers are calculated from the tables of composition and yield.

It is not easy to state on the basis of composition alone, the relative nutritive value of foods of different compositions. But upon their power to produce heat, the nutritive value of foods can be compared scientifically. Based on this, the following table compares the nutritive value of the total yield per acre of these six varieties of corn. The figures are calculated from the yield and analysis of the samples grown at this station. It must be remembered they refer to their nutritive or feeding value at the time of harvesting. The relative feeding values of the total crop of one acre of each of these varieties, at the time of harvesting, are to one another as these numbers. But made into ensilage, these varieties might not stand in the same order, owing to the influence of the maturity of a corn upon the quality of ensilage that it produced.

1. Mammoth Southern Sweet	100
2. True Leaming	87
3. Mammoth Cuban	82
3. Wisconsin Earliest White Dent	82
3. Compton's Early	82
6. Thoroughbred White Flint	70

Practical Points for Farmers.

In the twenty full reports received there are twelve that may be called heavy and eight that may be called light soils.

The previous cropping, that is, the cropping of 1891, was as follows: Two experimenters cropped with fodder corn, one with winter wheat, four with oats, five with potatoes, one with pasture, two with meadow, and one each with beans, millet, alsike and rape.

In four varieties, two following potatoes and two following fodder corn, the highest yield of twenty tests was on light soils, two located in Grenville and two in Elgin. In the other two varieties, one following beans and the other following oats, the highest yield was on heavy soil. In five varieties, four following oats and one following meadow, the lightest yield in twenty tests was on heavy soils, three located in Frontenac, one in Huron and one in Peel. The lightest yield in the sixth variety was on gravelly loam after potatoes, in the county of Dundas.

The results undoubtedly indicate that heavier yields of fodder corn are obtained from light, warm soils than from heavy soils; they also lead to the conclusion that when the land is not specially manured for corn, heavier yields are obtained after such crops as potatoes, roots or even fodder corn than after cereal crops as oats, wheat, etc.

A further examination of the individual reports of the farmers who tested these varieties shows that corn may be grown successfully after pastures, alsike, red clover and rape. Speaking generally, all of these varieties have yielded well, but corn grown for the silo must yield well and mature fairly well, and therefore in selecting a corn for the latter purpose it is very important that a variety be obtained that will mature well in that particular locality.

From the 38 varieties of mangels grown in 1892 by the Experimental department, we analysed four kinds: Carter's Champion Yellow Intermediate, a yellow root of medium length; Steele Bros. Long Red Selected, a dark-red, long root; Carter's Warden Orange, an orange colored, globe shaped root, and Red Globe, a dark red globe shaped root, were the varieties analysed. In that list of 38 varieties, arranged in the order of their yield of roots per acre, these varieties analysed are, respectively, 1st, 4th, 20th and 26th.

Eighteen varieties of fall turnips were also grown during 1892. From this number, Jersey Navet, a white fleshed, long, oval, spongy turnip; Red Globe Norfolk, a white fleshed, round, good root; Greystone Improved, a white fleshed, flat root of medium firmness; Orange Jelly, a yellow fleshed, round, good root; White Stone, a white fleshed, flat root of medium firmness; and Yellow Aberdeen Purple Top, a yellow fleshed, oval

shaped, good root, were the six varieties selected for analysis. These kinds stand respectively in the list of eighteen, arranged according to yield of roots per acre, 1st, 3rd, 4th, 10th, 11th, and 14th.

Five kinds of Swede turnips were analysed out of 44 varieties grown in 1892. White Swede, a firm, short necked root; Hartley's Bronze Top, a root having medium length of neck and not firm; Royal Norfolk, a short necked, firm root; Fetticairn Green Top, a long necked root of medium firmness; and Carter's Elephant, a long necked, spongy root, are the varieties analysed out of the list of 44. These kinds stand respectively, 1st, 6th, 22nd, 24th, and 25th in the list.

In the following table of composition, the percentages in every case are the averages of two analyses :

Varieties.	In Fresh Material.						Calculated to Water-free Substance.				
	Water.	Ash.	Crude Protein.	Crude Fibre.	Nitrogen-free Extract.	Crude Fat.	Ash.	Crude Protein.	Crude Fibre.	Nitrogen-free Extract.	Crude Fat.
Mangels.											
Carter's Champion Yellow Intermediate	91.91	0.68	1.00	0.67	5.67	0.07	8.46	12.45	8.33	69.79	0.97
Steele Bros. Long Red Selected	89.19	0.80	1.09	0.88	7.79	0.25	7.44	10.20	8.20	71.91	2.25
Carter's Warden Orange	89.59	0.90	1.91	0.89	6.63	0.08	8.72	18.44	8.66	63.35	0.83
Red Globe	88.36	0.82	1.89	0.91	7.71	0.31	7.06	15.92	7.89	66.54	2.59
Average	89.76	0.80	1.47	0.84	6.95	0.18	7.92	14.25	8.27	67.90	1.66
American average	90.85	1.05	1.39	0.87	5.68	0.16					
Swede Turnips.											
White Swede	85.04	0.69	1.31	1.39	11.43	0.14	5.00	9.89	10.14	73.93	1.03
Hartley's Bronze Top	87.35	0.73	1.61	1.19	9.04	0.08	6.45	14.00	10.58	68.36	0.61
Royal Norfolk	86.88	0.74	1.15	1.38	9.73	0.12	5.67	8.92	10.58	73.89	0.94
Fetticairn Green Top	88.05	0.74	1.51	1.31	7.97	0.42	6.28	12.71	10.80	66.63	3.58
Carter's Elephant	87.19	0.83	1.57	1.43	8.67	0.31	6.49	12.28	11.19	67.62	2.42
Average	86.90	0.94	1.43	1.34	9.39	0.21	5.98	11.56	10.66	70.08	1.72
American Average	88.61	1.15	1.18	1.25	7.66	0.15					
Fall Turnips.											
Jersey Navet	93.54	0.71	0.87	0.98	3.85	0.05	10.97	13.66	14.99	59.48	0.90
Red Globe Norfolk	92.65	0.69	0.84	1.17	4.49	0.16	9.47	11.41	16.05	60.95	2.12
Greystone Improved	92.35	0.67	0.80	0.99	5.01	0.18	8.87	10.49	13.06	65.26	2.38
Orange Jelly	92.89	0.80	1.37	1.08	3.83	0.03	11.36	19.27	14.95	53.85	0.57
White Stone	92.17	0.71	1.37	1.19	4.41	0.15	9.05	17.53	16.21	55.46	1.75
Yellow Aberdeen Purple Top	90.57	0.99	1.71	1.20	5.30	0.23	10.69	17.73	12.96	56.17	2.45
Average	92.36	0.76	1.16	1.10	4.48	0.12	10.07	15.02	14.69	58.53	1.69
American Average	90.46	0.80	1.41	1.15	6.27	0.18					

This table on composition shows that in the different varieties of the three kinds of roots (mangels, Swede turnips, and fall turnips) analysed, there is a variation in composition. Assuming conditions of cultivation are similar, the choice of a variety may mean an actual gain or loss of ten, twenty, or even fifty per cent. in food. The Canadian and American averages are closely identical in the three classes of roots. These averages

show that fall turnips contain the highest per cent. of water, and, therefore, the lowest per cent. of dry matter, or food; mangels come intermediate, and Swedes contain the lowest per cent. of water and highest per cent. of dry matter.

Considering the composition of these varieties of roots, as given in the above table, together with their yields, average weight per root, etc. (Annual Report of 1892, pp 87-91), important differences are observable.

Varieties.	Per cent. of dry matter.	Average weight per root.	Yield of roots per acre.	Dry matter per acre.
Mangels.		lb.	tons.	lb.
Carter's Champion Yellow Intermediate	8.09	2.72	25.78	4171.2
Steele Bros.' Long Red Selected	10.81	2.41	21.03	4546.6
Carter's Warden Orange	10.41	1.80	15.15	3154.2
Red Globe	11.64	1.61	12.98	3021.7
Swede Turnips.				
White Swede	14.96	2.51	25.13	7518.8
Hartley's Bronze Top	12.65	1.81	17.96	4543.8
Royal Norfolk	13.12	1.67	13.93	3655.2
Fetticairn Green Top	11.95	1.84	17.10	4086.9
Carter's Elephant	12.81	1.95	15.95	4086.3
Fall Turnips.				
Jersey Navet	6.46	2.08	21.38	2762.2
Red Globe Norfolk	7.35	1.78	17.78	2614 6
Greystone Improved	7.65	1.90	16.20	2478.6
Orange Jelly	7.11	1.32	13.15	1869 9
White Stone	7.83	1.91	15.10	2364.6
Yellow Aberdeen Purple Top	9.43	0.98	8.60	1621.9

Remembering that the dry matter of roots is apparently very thoroughly digested, this table makes it very evident that the yield alone does not determine the relative value of varieties. Carter's Champion Yellow Intermediate Mangel, for example, yields 25.78 tons per acre, while Steele Bros.' Long Red Selected yield 21.03 tons, being four tons less than the former; yet in this latter variety the product of an acre contains nearly 400 pounds more nutriment. This higher food value in the variety yielding a lower number of tons is due to its superior composition. The figures, under per cent. of dry matter, show the number of pounds of dry matter or food in 100 pounds of roots. Beginning with the lowest in each class of roots, these figures tend to occur in the same order as their respective numbers, beginning with the highest in the next column under average weight per root. That is to say, large roots apparently contain a lower per cent. of dry matter or food than smaller ones. A comparison of the figures in the two last columns makes it very evident that the relative yield per acre does not determine the relative feeding value of the product.

These facts contained in the above table lead to the following conclusions:

1. That farmers should not hastily conclude that the heaviest yielder is the most profitable variety to grow.

2. Medium sized varieties of roots may produce less weight but more feed per acre than very large kinds.

3. In choosing a variety, consider composition as well as yield.

4. Of the above varieties, Carter's Champion Yellow Intermediate is the most profitable variety of mangels, White Swede of Swede turnips, and Jersey Navet, Red Globe Norfolk and Greystone Improved, the best varieties of fall turnips.

During 1892 the Experimental department tested the effect of different distances between the plants in the drill upon the yield of fall turnips, Swedes and mangels. The width between the drills in every case was 27.7 inches. In the case of the mangels and Swedes the distances were, unthinned, 8 inches and 20 inches; and in the case of the fall turnips, 4, 12 and 20 inches apart, respectively. See Annual Report of 1892, pp. 88-92 The roots grown in these experiments have been analysed in the chemical laboratory to determine their relative composition; and the results, which are the average of two analyses, are given in the following table:

	In Fresh Material.						Calculated to water-free substance.				
	Water.	Ash.	Crude protein.	Crude fibre.	Nitrogen-free extract.	Crude fat.	Ash.	Crude protein.	Crude fibre.	Nitrogen-free extract.	Crude fat.
Mangels.											
1. Unthinned	78.07	0.61	1.31	1.49	18.11	0 41	2.80	5.98	6.79	82.59	1.84
2. 8 inches	86.76	0.79	1.33	1.00	9.87	0.25	5.98	10.04	7.57	74.50	1.91
3. 20 inches	90.77	0.83	1.08	0.77	6.43	0.12	9 01	11.79	8.36	69.55	1.29
Swedes.											
1. Unthinned	83.90	0.97	1.76	1.40	11.88	0.09	6.54	11.83	12.06	68.90	0.67
2. 8 inches	87.88	0.76	1.56	1.31	8.22	0.27	6.33	12.89	10.82	67.68	2.28
3. 20 inches	88.36	0.80	2 03	1.52	7.24	0.05	7.59	15.42	11.18	65.44	0.37
Fall Turnips.											
1. 4 inches	91.07	0.89	1.04	1.16	5.68	0.16	9.90	11.66	13.40	63.20	1.84
2. 12 inches	91.08	0.82	1.04	0.97	5.96	0.13	9.20	11.63	11.09	66.56	1.52
3. 20 inches	92.16	0.88	1.42	1.04	4.32	0.18	11.35	18.31	13.35	54.63	2.38

Prizes, in the root class at least, awarded by agricultural associations, were usually won, in past years, by exhibitors having the largest roots. But of late years judges have attached considerable importance to evenness of form and smoothness of skin. This appears to be a step in the right direction. The ultimate object in awarding prizes is to encourage increased production. It is not accomplishing the most to encourage increased production of crop regardless of the increase of nutriment. First prize may be given to larger, and second to smaller roots; yet the farmer owning the latter may

have produced, from an equal area, more pounds of nutriment. This man should have received the first, and the other the second prize. It does not require much skill to grow a few large roots. Usually, favorable conditions of soil and a little experience are sufficient. But to produce the largest weight of nutriment, or food, requires the application of a knowledge of the science of agriculture, together with experience and favorable soil conditions. Rewarding such a producer would greatly tend to encourage the application of thought in the cultivation of the soil.

The following table, giving the composition of one kind, each, of mangels, Swedes, and fall turnips, grown at different distances apart in the drill, shows a greater variation in the composition of the same variety than was observed in different varieties.

Distances.	Per cent. of dry matter.	Average weight per root.	Yield per acre.	Dry matter per acre.
Mangels.		lb.	tons.	lb.
Unthinned	21.93	0.16	15.45	6776
8 inches	13.24	1.34	19.32	5116
20 "	9.23	1.36	15.01	2771
Swedes.				
Unthinned	16.10	0.20	7.65	2463
8 inches	12.12	1.60	20.54	4979
20 "	11.64	2.44	14.00	3259
Fall turnips.				
4 inches	8.93	1.02	19.61	3502
12 "	8.92	1.59	17.57	3134
20 "	7.84	2.97	13.19	2068

Conclusions.

1. Variation in distance between the plants influences the size, the yield and the composition of the roots.

2. There is a regular decrease in the per cent. of dry matter with an increase in the distance between the plants.

3. There is a regular increase in the average size of the roots with an increase in the distance between the plants.

4. It appears from conclusions 2 and 3 that conditions increasing the average size of roots increase their per cent. of water.

5. Yield increases with an increase in distance between plants in the drill to a certain distance, which appears to be between 8 and 12 inches, and beyond this it decreases.

6. More dry matter is produced by thinning to a distance of eight than twenty inches.

7. Roots tending to lengthen rather than broaden, should be thinned to a distance of 8 or 9 inches apart in the drill, otherwise the distance should be about 10 inches.

In concluding my report, I beg to remind you that the basement of the chemical laboratory is still occupied by the Experimental department. This part of the building, fitted up as an analytical class-room, is greatly needed by the Chemical department.

Very respectfully yours,

A. E. SHUTTLEWORTH.

PART IV.

REPORT OF THE

PROFESSOR OF VETERINARY SCIENCE.

To the President of the Ontario Agricultural College :

SIR,—I beg to present my first annual report. I received the appointment of Professor of Veterinary Science, on the 31st of December, 1892, and have given professional attention to the stock of the farm since. I am pleased to be able to report comparatively little loss.

Horses. In horses we have had some serious cases of acute indigestion, but no fatal cases of any kind.

Cattle. We had one fatal case of parturient apoplexy in a Jersey grade cow in the dairy stables. There were some serious cases of metritis (inflammation of the womb) and many cases of minor importance, all of which recovered. With the exception of the case mentioned we had no deaths, except those we slaughtered. On December 31st, I was asked to examine two cows that were not doing well. I condemned them as presenting very strong symptoms of tuberculosis, and ordered their isolation. On my return from Institute work, about January 21st, I found one of these animals much worse, and on gaining your permission I slaughtered her and found on holding a *post mortem* that she was very extensively diseased. The other cow was thriving tolerably well and we kept her isolated. She gave birth to twin calves, one of which lived. Under instructions from the Minister of Agriculture, I tested this cow and some more of which I was suspicious, with "Prof. Koch's lymph," or tuberculin. The mode of testing is as follows: A ten per cent. solution of the lymph is made in a one per cent. solution of carbolic acid and injected hypodermically into the animal as follows. The seat of injection, "usually the loose skin just back of the shoulder," is sterilized by, say, a five per cent. solution of creolin, the syringe is also disinfected by the same, and from 3 to 4 cubic centimetres, "50 to 70 drops," is injected. The temperature of the animal is taken before the injection, and every two hours or so after for 15 to 18 hours. A rise of two degrees of temperature is supposed to denote tubercle. In healthy animals the increase of temperature is slight, but in diseased animals it begins to increase in from 4 to 12 or 14 hours, and continues to increase until in some cases it reaches as high as 7 or 8 degrees above normal. The degree of increase of temperature does not in all cases denote the extent to which the disease has reached, but I find as a rule an animal that is extremely diseased shows an increase earlier than one in which the disease is in an incipient or early stage. My experience with the test has been that it can be depended on in all cases. Some animals that it condemned were very slightly affected, but in no case did it condemn an animal that

was not diseased. With one exception this has been the experience of all the writers whose views I have read. The exception mentioned is that of Prof. Brown, "an English writer," who says that in about ten per cent. of the cases tested it was wrong—that it indicated disease in some animals that were not diseased and *vice versa*. Even if this be so it is a wonderful aid in diagnosing the disease, and if the government should see fit to class this disease in the contagious disease Act, and endeavor to stamp it out by slaughtering all diseased animals, this test will be of great value. As there is no doubt that the trouble is more common in cattle than is generally supposed, the subject is worthy of the most serious consideration of the government. The slaughter of all affected animals would entail serious loss to individuals, unless remunerated by the government I do not think there is any danger in using the milk of affected animals, unless the udder or lacteal apparatus be affected, or in using the flesh of diseased animals unless the muscles be diseased, and not then if the flesh be well cooked; but as the disease is infectious we cannot tell where it will stop. It was thought, at first, that the use of tuberculin would cure consumption or tuberculosis in man, but it was a forlorn hope, and it is generally conceded now that it increases rather than decreases its activity. My observation of its use in cattle have lead me to the following conclusions: In healthy animals it has no constitutional effects, beyond possibly exciting a slight fever for a few hours. In animals even slightly diseased, the fever is much better marked, and if a milch cow the secretion of milk is considerably reduced for some time, and in some cases the general thriftiness of the animal is interfered with. If the animal be in calf, especially if a heifer carrying her first calf, she is prone to abort. Further experiments of a more thorough nature in regard to tuberculosis and the use of tuberculin have been undertaken and are now in progress. At the time of writing this (December 1st) the tests are not sufficiently advanced to make a definite report as to results.

Sheep. We lost a couple of ewes from grub in the head, and four ewes from liver disease, the cause of which I could not very well determine, and a ram from injury to the head, in all probability received from fighting. Also two or three lambs from a collection of wool in the stomach, stopping the passage into the intestine, but comparatively speaking our losses in sheep were light. Knowing that for several years the institution had sustained serious loss in lambs by death from tapeworm, I decided to experiment in order to, if possible, prevent the trouble. I treated all the lambs with a decoction of pumpkin seeds every week or ten days, from the middle of May until the middle of August, and I am pleased to state thet we did not have a single case of tapeworm. As one experiment will hardly establish its efficiency, I expect to repeat it next season.

Swine. With the exception of newly-born pigs, we had but one death among the swine, that being a Berkshire barrow that died suddenly, and a *post mortem* revealed rupture of a blood vessel.

Respectfully submitted,

J. HUGO REED, V.S.

PART V.

REPORT OF THE LECTURER ON HORTICULTURE.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to present herewith my report for the Horticultural department, and as my duties began here only two months ago, it will necessarily be brief.

My work in this department is of a two-fold nature.

1. Class room work, which has so far engaged the most of my attention, in teaching the principles and practice of horticulture.

2. Outside work, connected with the management of different branches of this department.

The outside work may be treated of under three heads:

1. Supplying the College and beautifying the grounds.
2. Conducting the work that it may be an object-lesson for the students.
3 Giving the public the benefit of practical experiments.

1. SUPPLYING THE COLLEGE.

Supplying the College with fruits and vegetables and beautifying the surroundings has so far been the main object of the work in this department; and I think the work done reflects credit on those who have had it in charge.

The kitchen-garden consists of about four acres, and has this year yielded sufficient of most vegetables, with the exception of potatoes, to supply the demands of the College.

This supply from the garden is supplemented during the winter and early spring with radishes, lettuce, tomatoes, etc., grown in the forcing-house.

The fruit supply has been in some respects limited. Of the small fruits—strawberries, raspberries, currants and gooseberries, there is a good sized plantation, and I am told the yield from it the past season was excellent.

Of the larger fruits—apples, pears and grapes—there has been little or none; the apple crop being a failure, and the pear trees and grape vines not yet being of a bearing age. During the past eleven months $535.65 worth of fruit and vegetables have been supplied to the College, and $55 worth have been sold to parties coming for it.

The management of the lawns, green-houses and ornamental clumps has during the past been the heaviest work in this department. The lawn covers an area of about twenty-three acres; and, with its extensive drives, flower beds and shrubbery clumps, has, it is estimated, between six and seven miles of border, which is kept in trim with the edging-knife. The lawn is gone over regularly with mowers and kept in first-class condition, requiring a good deal of labor in the spring and summer months.

Our new green-houses, in extent and completeness, are probably unequalled by those of any other similar institution on the continent. We have an area of about seven thousand square feet under glass, and the houses are fitted up with all the latest modern improvements. They are well stocked with ornamental plants, a number of which did good service this year in contributing to Ontario's display at the World's Fair.

We have not yet as full a collection of economic plants as we would like, but hope before long to have a more complete list of these for instructive purposes.

Besides, the lawn and green-houses add much to the immediate surroundings of the College, and are a great source of attraction to visitors, there is a good sized arboretum, and a number of forest tree clumps scattered over different parts of the farm. Some of these clumps help much to improve the surrounding landscape, and are useful in hiding unsightly gravel knolls, while others occupy land which, we think, might better be included in the surrounding fields.

A much better plan, we think, of ornamenting our surroundings, and at the same time affording shelter to the adjoining fields, would be to plant forest tree-belts all along the western boundary of the farm. There are in the nursery here between thirteen and fourteen thousand trees which might be used in this way; and as the nursery occupies land which should properly be included in the surrounding field, we would recommend that the trees be taken up and so utilized.

During the past season several hundred elms were planted along the sides of the farm lane, and a large number of pines were set out on the grounds back of the College, which will in a few years add much to the general appearance of the place.

2. Providing an Object-Lesson for Students.

This has not in the past been as prominent a feature of the work as it should have been. We hope to be able to make it more prominent in the future. Students certainly have had excellent opportunities for observation in landscape-gardening and floriculture, and, to a certain extent, in vegetable gardening; but in fruit culture their lessons have not been of the most encouraging nature. In the first place, our vegetable garden is encroached upon by a combination of orchard trees, small fruits and flowers. These objectionable features should be removed as soon as can be reasonably done, and the whole land given up to the growing of vegetables.

In the second place, our orchards are not large enough and do not comprise enough of some of the most important fruits to illustrate their culture. The heavy crop borne this year by the few scattered plum trees in the garden indicates that we might be justified in putting out a good representative orchard of that fruit at least.

It is unfortunate that there is not a field naturally dry enough for an orchard situated sufficiently near that the fruit may be protected from outside depredations. Field No. 13, in which most of the fruit trees now stand, is the most conveniently situated, and as it seems to be the only choice, we would recommend that it be thoroughly underdrained; then a larger portion of it could be planted with the most promising and hardy varieties of such of the larger fruits as apples, pears, plums, cherries, quinces and grapes. A portion of the balance could be devoted to a small nursery for the propagation of the fruit and ornamental trees and bushes required on the place; and the balance of the field, as the orchard trees became older and required all the ground between the rows, could be given entirely to the growing of such small fruits as currants, gooseberries, raspberries, blackberries and strawberries. In that way this portion of the work of this department could be concentrated, instead of being scattered over the farm as at present; and with the orchards and fruit plantations so extended, students could have ample opportunity of becoming thoroughly familiar with the management of the different fruits.

3. Conducting Experiments.

This should be an important feature of our work, and we hope to be able to make it so. At an experiment station of this kind we are expected to aid the farmers and fruit-growers of the province in testing and reporting on new varieties, methods of culture and anything that may be of value in this line of work. The fruit growers of the province have been long asking the Government for an experiment station where such work could be carried on in a more favored section of the country. But as this has never been granted, we trust a liberal appropriation will be made for commencing the work here.

On account of the severity of the climate, we may not be able to succeed with many of the more tender varieties, but it should be gratifying to know that what is hardy enough to succeed here should do well over most other parts of the province. In that respect results obtained here might be a safer guide to fruit growers generally than results from a more favored locality.

Hoping in the near future to be able to report more particularly on what has been done than on what we hope to do, I am,

Respectfully yours,

H. L. HUTT.

Guelph, Dec. 30th, 1893.

PART VI.

REPORT OF THE

LECTURER ON AGRICULTURE.

To the President of the Ontario Agricultural College.

SIR,—I have the honor of submitting herewith a report outlining the work of my department. As I have had charge of this work only since October 1st, my report is, of necessity, a short one.

During the term lectures on live stock, principles of breeding and stable management, have been delivered to the first, second and third year students.

The work covered by the first year comprises lectures on stable management an practical work in judging live stock. Stable management is made to include the construction of farm buildings with regard to economy, convenience, ventilation, etc., coupled with lessons on the management of live stock. In this work the students are taken through the stables, and the many things that characterize good and bad management in feeding, watering, cleaning, etc., are pointed out and discussed; while the excellencies and deficiencies of the different buildings with regard to comfort, convenience, ventilation and general arrangement, are also noticed.

In the first year work in live stock no attempt is made to discriminate breed characteristics, but as many animals as possible are brought into the class-room, and judged solely on the basis of utility.

We also expect to complete a series of lectures on the management and application of farmyard manure, the principles underlying the chief operations of tillage, the cultivation of some of our more important crops, etc.

Second year work comprises the judging of animals as breed representatives, as well as for utility; also a course of lectures on the feeding and management of live stock and some of the simpler principles of breeding.

Third year work comprises a more extended course of lectures on the principles of breeding, coupled with practical drill in judging live stock.

To assist in training students to observe all the points of an animal, and to give him some idea of the relative importance of the various points, a system of score cards has been devised. The idea was obtained from Professor Craig, of the University of Wisconsin, who is one of our graduates. A sample score card is here furnished, being the one used for beef cattle:

ONTARIO AGRICULTURAL COLLEGE.

STUDENTS' SCORE CARD. No. 1.

Scale of Points for Beef Cattle.	Possible Score.	Students' Score.	Corrected.
A. *General Appearance:*			
Estimated weight ... lbs.			
Weight, according to age	5		
Form, deep, broad, low set, with straight top line and underline	8		
Quality, hair, fine; skin, pliable; bone, dense. All parts evenly covered with firm flesh	8		
Style, active and sprightly	1		
Temperament, neither sluggish nor wild	4		
B. *Head and Neck:*			
Muzzle, fine; mouth, large; lips, thin; nostrils, large	1		
Eyes, large, clear and placid	1		
Face, short; expression, quiet	1		
Forehead, broad and full	1		
Ears, medium in size and fine in texture	1		
Neck, thick and short; throat, clean	2		
C. *Fore-quarters:*			
Shoulder vein, full	3		
Shoulders, smooth, well fleshed, compact on top	4		
Brisket, extending well forward; breast, wide	2		
Dewlap, light	1		
Legs, straight and short; arm, full; shank, fine, smooth	3		
D. *Body:*			
Chest, full, deep and wide; girth, large; crops, full	10		
Ribs, long, well arched and thickly fleshed	5		
Back, broad and straight	6		
Loin, thick and broad	5		
Flank, full and even with underline	3		
E. *Hind-quarters:*			
Hips, smooth and proportionately wide	4		
Rump, long, even and wide; tail-head, smooth	5		
Pin bones, smooth and well set apart	3		
Thighs, full	3		
Twist, deep and plump	4		
Purse, full	2		
Legs, straight and short; shank, fine and smooth	3		
Tail, fine	1		
Total	100		

Animal.....

Student..... Date.....

A similar card is used for the dairy type of animal, for mutton sheep and for swine.

Possibly no score card could be devised that would be above criticism. In our score cards an attempt has been made to give only approximately the relative value of the various points. They are used only occasionally, and on these occasions they are used solely for the purpose of training students to notice all the points of the animal, to observe them critically and to distinguish the important from the unimportant. In judging, the score card is never used.

The interest evinced by the students in the different branches of this department is highly encouraging, and we feel confident that the present year will be a profitable one.

Respectfully yours,

G. E. DAY.

GUELPH, December 30th, 1893.

PART VII.

REPORT OF FARM SUPERINTENDENT.

To the President:

SIR,—I have the honor of herewith submitting my report, dating from the first of October last, when I commenced my duties as Farm Superintendent. Mr. J. E. Story was then Farm Foreman.

SILOS.

Dairy Silo: Mr. Story had completed filling the dairy silo. This is a circular building, 24 feet in diameter and 29 feet high; its estimated capacity is 250 tons of ensilage. The cost of filling this silo was given at $187, and the cost of producing the corn $150 making a total of $337. There were 22 acres of corn put in this silo: equal parts of Comptom's Early, Salzer's North Dakota, Wisconsin Early, White Dent and Mammoth Dent.

Farm Silo: The filling of the Farm silo commenced on the twenty-seventh of September, and was completed on the sixth of October. This silo is 14 feet by 17 feet, and 36 feet high. This building was filled with 20 acres of corn (of the same varieties as used for the Dairy silo) and 5 acres of millet.

The Ensilage: The dairy silo was opened on the tenth of November, and they commenced feeding to the cows. It is in good condition.

The Farm silo has not been opened yet.

FIELD CROPS.

The following is a list of the field crops grown during the summer of 1893:

Field No. 1, 20 acres: Lucerne and clover, hay.

Field No. 2, 17 acres: Siberian oats, 10 acres; Bavarian oats, 7 acres.

Field No. 3, 16 acres: Ensilage corn.

Field Nos. 4 and 5, 20 acres; Hay, 10 acres; pasture for the Dairy, 10 acres.

Field No. 6, 20 acres: Barley, 15 acres; mixed experiments, 5 acres.

Field No. 7, 20 acres: Prussian Blue peas, 12 acres; D'Auvergne peas, 5 acres; tall Turkish peas, 1½ acres; tall White Marrowfat peas, 1½ acres.

Field No 8, 20 acres: Joanette oats, 10 acres; Besthorn oats, 5 acres; Poland oats, 1 acre; Danebrog oats, 4 acres.

Field No. 9, 20 acres: The following varieties of spring grain were grown: Blue stem wheat, 1 acre; Pringle's Champion wheat, 1 acre; Red Fern wheat, 1 acre; Herison Bearded wheat, 1 acre; Highland Chief barley, 4 acres; Guyamaloga barley, 1 acre; Mandscheuri barley, 6 acres; Kinna Kulla barley, 2 acres; Hungarian barley, 3 acres.

Field No. 10, 13 acres: Hay, 6 acres; corn and other feed for the Dairy, 7 acres.

Field No. 11, 23 acres: Mandscheuri barley, 8 acres; balance in mixed wheat, oats and barley in equal quantities.

Field No. 12, 17 acres: Timothy hay.

Field No. 13, 15 acres; Ensilage corn, Mammoth Cuban, Wisconsin Early, Early White Dent, Salzer's North Dakota and Comptom's Early, equal quantities.

Field No. 14, 24 acres: Hay, 6 acres; experimental, 18 acres.

Field No. 15, 24 acres: Permanent pasture.

Field No. 16, 26 acres; Fall wheat, 2 acres; rye for pasture, 24 acres (afterwards plowed and sown with millet).

Field Nos. 17 and 18, 33 acres: used by Mr. Zavitz for experimental purposes.

Field No. 19, 30 acres: Fall wheat (4 varieties), 13 acres; sugar beets, 4 acres; mangels, 4 acres; potatoes, 4½ acres; Swede turnips, 4½ acres.

Field No. 21, 12 acres: Lucerne clover meadow.

Potatoes and Root Crops

On the seventh of October we commenced to take up the potatoes in field No. 19. Owing to the drouth the yield was poor.

The mangels, in the same field yielded 54 tons. These were pulled on the tenth and eleventh of October, about a week earlier than is necessary in many parts of Ontario. They were pitted in the field to sweat, and two weeks later were put into the cellar in first-class condition.

The sugar beets, also in the same field, yielded 46 tons. These were treated the same as the mangels.

The Swede turnips, which were also in No. 19, yielded 80 tons. These were pulled and put into the cellar on the 27th, 28th and 30th of October.

Fall Plowing.

As soon as the silos were filled the five teams were kept plowing, with little cessation, until the fifteenth of November, when we finished. We have 194 acres ready for spring crops. About half of this was gang-plowed after harvest, and plowed later with the ordinary plow.

Thistles and Other Weeds.

I understand that very much has been done to eradicate the Canada thistle and other noxious weeds from the farm; but I find that there is a great deal yet to be done in this line before the farm is clean.

Fences.

I hope a liberal grant will be given to renew the fences. The boundaries especially require attention, for the fences have outlived their usefulness.

Repairing Buildings.

Under Mr. McIntosh, the students repaired and painted the carpenter shop and implement buildings this fall. They used a cheap paint. This work was very much needed.

Permanent Improvements.

I have had the public road, which runs north-west of the College grounds, graded from the Brock road to the stream north-east of the College.

It is ready now for the gravel, which I intend to have hauled during the winter. I have also had the students grade and pave the gutters of the drive, from the College north-east to the experimental grounds.

We have removed the large pile of debris consisting of lumber, posts and stones, from the rear of the carpenter shop and implement sheds. The ground has been plowed and is ready for grading in the spring.

Live Stock.

I found the cattle, sheep and pigs not in the healthy condition I expected, considering the food and attention they were receiving. On examination I found them affected, more or less, with lice.

Cattle Lice: The cattle were troubled with what is known as the Short-nosed Ox-louse (*Hæmatopinus eurysternus*). An effectual remedy for this pest was found to be pyrethrum, an insect powder, which was dusted over the animals' backs and rubbed in by hand. Several animals were washed with Little's dip. This did not kill quite all the lice with one application, but very few were to be found a week afterwards; a dusting with the pyrethrum completed the work.

Sheep Lice: A small, pale-red louse, called the sheep louse (*Tricodectes sphærocephalus*), affected the sheep. One application of Cooper's dip completely destroyed this parasite and also the common sheep tick.

The Pig Louse: The pigs were badly affected with a louse called *Hæmatopinus suis*. We got rid of them after two applications of Little's dip. One objection I have to this dip is that it leaves a dark scurf on the skin for some time.

Annual Sale.

Under instructions from the Minister of Agriculture, the annual sale of young pure-bred stock was held at the Victoria Rink, Guelph, on Thursday, the seventh of December, 1893.

The following is a list of animals sold and prices realized:

Cattle.

1 Shorthorn bull, calved	March 12th, 1893	$105 00	
1 " "	January 13th, 1893	90 00	
1 Hereford "	March 15th, 1893	76 00	
1 Aberdeen Angus bull, calved	March 20th, 1893	30 00	
1 Galloway bull, calved	January 31st, 1893	105 00	
1 Devon "	April 7th, 1893	36 00	
			$442 00

Pigs.

2	Berkshire pigs, farrowed	November 6th, 1892	$ 71 00	
9	Yorkshire "	March 28th, 1893	162 00	
5	" "	May 24th, 1893	60 00	
8	" "	June 2nd, 1893	122 00	
5	" "	June 30th, 1893	57 00	
7	" "	September 21st, 1893	68 00	
3	Tamworth "	April 19th, 1893	40 00	
2	" "	September 16th, 1893	19 00	
2	" "	September 20th, 1893	18 00	
				$617 00
				$1,059 00

INVENTORY OF LIVE STOCK.

The live stock at present on the farm represents the following breeds of cattle, sheep and swine. The horses used on the farm are included:

Horses.

11 horses for farm work, estimated value	$1,050 00	
1 horse for general purposes, estimated value	50 00	
		$1,100 00

Cattle.

Shorthorns: 1 (imp.) bull	$200 00	
3 cows	400 00	
Herefords: 1 (imp.) bull	100 00	
2 cows	250 00	
1 yearling heifer	60 00	
Galloways: 1 (imp.) bull	175 00	
2 (imp.) cows	300 00	
1 heifer (imp. in dam)	75 00	
Polled Angus: 1 (imp.) bull	200 00	
1 cow	150 00	
1 yearling heifer	75 00	
Sussex: 1 (imp.) bull	125 00	
2 (imp.) cows	250 00	
1 yearling heifer (imp. in dam)	100 00	
Devons: 1 cow	90 00	
1 two-year old heifer	75 00	
Norfolk Red Poll. 1 (imp.) bull	150 00	
Jerseys: 1 bull	100 00	
Holsteins: 1 bull	150 00	
Ayrshires: 1 bull	50 00	
Grade cattle: 11 cows	400 00	
5 yearling steers	125 00	
		$3,600 00

Sheep.

Dorset Horned: 1 ram	40 00	
9 ewes	225 00	
5 ram lambs	60 00	
3 ewe lambs	30 00	
Southdowns: 1 ram	25 00	
4 ewes	100 00	
3 ram lambs	30 00	
2 ewe lambs	25 00	

Suffolks: 1 ram	15 00	
3 ewes	100 00	
4 ram lambs	45 00	
3 ewe lambs	30 00	
Hampshire downs: 4 ewes	120 00	
5 ram lambs	60 00	
1 ewe lamb	15 00	
Shropshires: 1 ram	75 00	
10 ewes	250 00	
4 ram lambs	50 00	
8 ewe lambs	100 00	
Oxford Downs: 1 ram	75 00	
3 ewes	30 00	
3 ram lambs	18 00	
3 ewe lambs	15 00	
Leicesters: 1 ram	40 00	
3 ewes	60 00	
2 ram lambs	25 00	
2 ewe lambs	20 00	
Cotswolds: 1 ram	40 00	
4 ewes	100 00	
1 ram lamb	8 00	
2 ewe lambs	15 00	
Lincolns: 1 ram	40 00	
4 ewes	125 00	
1 ram lamb	15 00	
Grades: 9 grade ewes	45 00	
54 lambs and ewes	175 00	
		$2,241 00

Swine.

Berkshires: 1 boar	40 00	
3 sows	75 00	
Tamworths: 1 boar	25 00	
2 sows	75 00	
Improved Yorkshires: 2 boars	50 00	
3 sows	150 00	
15 sucking pigs	65 00	
		$480 00
		$7,421 00

FARM IMPLEMENTS.

The total value of farm implements on hand amounts to $1,900.

Your obedient servant,

WM. RENNIE,
Farm Superintendent.

Guelph, December 15, 1893.

PART VIII.

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 work conducted in the Experimental department during the year 1893. Although it is over seven years since I first became connected with the experimental work of this institution, I now present my first report since being placed at the the head of the Experimental Department. Prof. Shaw, who was superintendent of experiments for nearly five years, and who sent his resignation to the Minister of Agriculture in September last, was somewhat closely connected with much of the experimental work, especially that part relating to live stock. In 1892, part of the report was prepared in the summer months, and the remainder during November and December, by Prof. Shaw and myself, and the whole of the report was submitted for your approval early in January. During the present year I have had but little help with the report from Prof. Shaw and the time for its preparation has been quite limited. The plot work required close supervision until the end of October, and consequently many of the grains could not be weighed and tested until the month of November. Owing to the limited time for preparing a report of so large an amount of experimental work, I have found it impossible to present many of the results of the tests in the manner which I had intended.

FIELD PLOT EXPERIMENTS.

The most extensive branch of work in connection with the Experimental department is that conducted in the trial grounds. Our experimental plots are becoming more complete, more attractive and more useful year by year. During the past season, there were upwards of 1,600 small plots, covering an area of about fifty acres. These varied from the one hundred and sixteenth of an acre to one acre in size, and were situated in three different fields. A field of twenty acres lying at the rear of the College building, was transferred from the Farm to the Experimental department in 1892. This land was thoroughly underdrained the same year, and then sown with rape, the crop being pastured off by lambs in the following autumn. As early in the spring of 1893, as the ground would admit, the field was very carefully measured out into small plots, of sufficient size for experimental work with grains, roots, etc. The half of the field upon which grains were sown had not received manure for some years, and the other half got a dressing of fifteen tons of farmyard manure per acre just before preparing the land for the roots. The second field contained thirteen acres and was situated at the north of the one mentioned above. It had been used for growing experimental crops for three years previously, and was sown with fodder crops, beans, peas, sunflowers, millets, etc., in the spring of 1893, and with winter wheat in the previous autumn. The third field devoted to experimental work was the one lying east of the farm buildings, which was divided into plots by Prof. Brown in 1883. This field contained experiments with grasses, clovers, fodder corn,

potatoes and rape during the present year. Many of the farm fields were divided into sections of two to five acres, which were sown with choice varities of farm crops, the seed being mostly supplied by the Experimental department. The results of the tests conducted in the experimental fields are given quite fully in this report.

Live Stock Experiments.

There have been six experiments conducted during the year is live stock feeding. Of these three were with lambs, two with steers and one with milch cows. They included one hundred and seventy-one animals in all. The third of a series of experiments in preparing lambs for the British market was completed during the year, and the summary results of the three years' work is presented in this report. The results of the experiment in feeding corn ensilage and straw to steers were prepared for print by Prof. Shaw and myself before his resignation in September last.

Co-operative Experiments in Agriculture.

A very important feature of the Experimental department is its system of co-operative work in agriculture, which has been established over Ontario. Fertilizers and seeds of superior varieties of farm crops are distributed annually among the graduates of the College through their association known as the Agricultural Experimental Union, and also among other interested and progressive farmers throughout the Province. During the present year no less than 322 packages of fertilizers, 894 of fodder seed, 1,230 of root seed, 3,110 of spring grain and 1,650 of winter grain were sent out to Ontario farmers.

This system of co-operative experimenting was started upon its present basis in 1886. In the first year of the work there were only twelve experimenters, in 1887, sixty; in 1888, ninety; and since that date the work has had a steady and substantial growth in accordance with the development of the station and the demands of the Province. There are at present upwards of eleven hundred experimenters with spring and winter crops. Most of the reports of the work for 1893 have been received, and nearly all the experimenters are desirous of continuing the experiments during 1894, there being less than five per cent. of the whole number who do not desire the material for the tests to be sent to them next spring. Not one complaint has been received regarding either impurity or inferiority of seed sent out in connection with the tests. For full particulars regarding the co operative experiments in agriculture the reader is referred to the report of the Agricultural Experimental Union, which can be found in the latter portion of this volume.

Visitors to the Experimental Department.

The thousands of farmers who visited the institution in the month of June, as well as those who came at other times in the year, appeared to take much interest in our experimental work. The plots presented a good appearance during June, but the growth was too small to give the best opportunity for study. The winter wheat varieties, however, were sufficiently well advanced to show their habits of growth quite satisfactorily. The latter part of July is usually the period in which the plots can be studied to the best advantage. The crop on each plot has features of its own, which cannot be well understood at a glance, and the man who visits the experimental fields at the best season of the year, and who has note-book in hand, and time at his disposal, is the man who is likely to get the greatest good from a trip through the trial grounds. To go through two of the experimental fields and merely read the labels placed at the plots, would require a journey of over four miles. It is impossible for an excursion of farmers to spend a part of a day or even a whole day at this institution, visit the different departments, and at the same time carry home with them much detailed information regarding our experimental work. We are, however, always glad to co-operate with yourself in welcoming the farmers to the institution, even though they come in very large numbers and remain but a very short time, realizing that after seeing the careful and systematic way in which the work is conducted, the report of the experimental results will be read with even more interest and value by those for whom it is prepared. The Minister of Agriculture has no doubt taken a wise course in encouraging the farmers to visit the College and observe for themselves the work which is being done.

Our College Exhibit at the World's Columbian Exposition.

At the request of Mr. N. Awrey, M.P.P., Ontario Commissioner at the World's Columbian Exposition, Hon. John Dryden, Minister of Agriculture, and yourself, an exhibit from our Experimental department was presented at the World's Fair during the past summer. No attempt was made to illustrate the whole of the experimental work which is now being carried on at the College. The exhibit was confined to varieties of barley, peas, spring wheat, winter wheat, oats and fodder corn, all of which had been grown in our trial grounds. The collection contained about 500 varieties, and in the case of many kinds, showed the fourth year's growth from seed originally imported by this station from Germany, Italy, Sweden, Russia, England, and Scotland; from France, Switzerland, Hungary, Greece, and Sicily; from Egypt, Japan, New Zealand, Australia, and the United States. The principal Ontario varieties were, of course, presented in the collection. All the grains were shown in glass sample jars, and most of them were exhibited in the straw as well.

On reaching Chicago on the 21st of March last I found Mr. Awrey had secured a most excellent space for the Ontario exhibits of grain, grasses, etc. This was located in the central part of the magnificient agricultural hall and fronted leading passage-ways along two sides. At the request of Mr. Awrey, I prepared the designs for both the Ontario and the College exhibits in agriculture. Work was at once commenced, and in a short time the Ontario court gave an entirely changed appearance. In the central part, the Agricultural College trophy was erected with its central dome reaching fully twenty-five feet from the main floor, while the smaller domes at the sides extended upwards for a distance of about eighteen feet. There was a a walk of six feet between the College trophy and the Ontario exhibit of grains, grasses, etc., which occupied the outer portions of the court on all sides. Just before the College exhibit had reached completion, the spring opened up, and it was necessary for me to return to Guelph to look after the work on the experimental plots. Mr. Awrey's staff of able assistants, went on with the work, and by the time the Exposition was officially opened, the Agicultural exhibits in the Ontario court were perhaps the nearest to completion of any in the entire building. During the latter part of May, I went back to Chicago and labelled all the samples in the College exhibit. Every variety was properly named, and was also numbered according to the official catalogue.

The following are a few of the many comments made by the public press of Canada and the United States, upon the Ontario Agricultural College exhibit at the World's Columbian Exposition:

"The display made by the Agricultural College of Ontario shows what an Agricultural College can do and it would be a good idea for the trustees of our State Agricultural College to visit the Canadian pavilion, and then ask why we have nothing similar to show for the expenditure of the people's money."—"*Standard*," *Chicago*.

"A prominent feature of the Canadian exhibit is that contributed by the Ontario Agricultural College and Experimental Farm at Guelph, which was arranged by Mr. C. A. Zavitz, a member of the College staff. The pavilion as a whole is artistically trimmed and decorated with grains and grasses."—*Dominion Illustrated Monthly*.

"The Agricultural College of Ontario has employed corn and grain in sheaf and native grasses to form a design that can only be appreciated when seen."—*National Popular Review*.

"Mr. C. A. Zavitz, B.S.A., of the Ontario Agricultural College, may well feel proud of his work in designing the Ontario court, with its inner temple, dedictated as it is to his Alma Mater, for its component parts and the elements from which it is elaborated are from the Guelph College of Agriculture."—*Toronto Daily Mail*.

"The Ontario show of cereals was very carefully selected and the arrangement was the work of the Ontario Agricultural College. In comparsion with the near-by displays made by Ohio, Indiana and other States, Ontario certainly more than holds her own. The quantity, quality, variety and tasteful arrangement are in striking contrast to the exhibits of western cereals."—*The Illustrated Buffalo Express*.

"The Agricultural Building is a truly palatial structure, and the space allotted to Canada is prominent and liberal. Her court is in the south-east corner of the building, Ontario having about 1,500 square feet fronting on two sides. No similar space in the building is more attractive, thanks to the excellent taste displayed in the design. . . . . In the interior is undoubtedly the finest trophy in the building, if not the handsomest ever erected for the purpose of the kind. Covering a space of nearly 150 square feet, it rises about 25 feet by a series of terraces, and on it are artistically arranged glass vases filled with grain samples. The name of the Ontario Agricultural College, Guelph, is embroidered, so to speak, on either side of the trophy in cross sections of Indian corn. There are no less than one hundred varieties of oats, one hundred and thirty of wheat, seventy of barley, and others in like proportion, all the produce of the College Farm, which is the pride of every Ontario farmer, and acknowledged to be one of the leading schools of practical Agriculture in the world Surmounting the whole is an enormous glass jar containing about a bushel of choice peas."—*The Farmers Advocate and Home Magazine, London.*

World's Agricultural Congresses.

The World's Congress Auxiliary of the World's Columbian Exposition, will, perhaps, have more lasting influence upon mankind than even the Great Fair itself. From the first of May until the end of October of the present year a regular series of congresses were held in the Memorial Art Palace, Chicago The time devoted to the Department of Agriculture extended from the 16th to the 23rd of October, and in some instances no less than eight agricultural congresses were in session at the same hour.

The Association of American Agricultural Colleges and Experiment Stations also met in the Art Palace on the 17th, 18th and 19th of October, and held its sessions in harmony with the section on "Agricultural Education and Experiment," of the World's Congress Auxiliary. Representatives from many foreign countries were present and spoke at the various meetings upon the development of agricultural education and experimentation in their respective lands. Nearly all, if not all, of the American Agricultural Colleges and Experiment Stations, had their delegates at this great parliament of Agriculture, and I wish to thank you most kindly for sending me as the delegate from our own institution. It was my privilege, while there, to attend every session of the section on "Agricultural Education and Experiment" of the World's Congress Auxiliary and also of the Association of American Agricultural Colleges and Experiment Stations. Avenues of thought were there opened up, which, I am sure, will result in much good for the work to which I am devoting the whole of my energies.

Experiments in Growing Grain.

A regular system is followed in growing grain for experimental purposes. All varieties are grown under as nearly the same conditions as can be obtained. The size of plot chiefly used is 100 links long by 10 links wide, thus being exactly $\frac{1}{100}$ of an acre. Great care is exercised to have all plots exactly true to size. Upwards of 400 varieties of grain were grown upon uniform plots during the present year. Some of them had been grown for four years previously, some three, some two, some one and some were grown this year for the first time upon our trial grounds. The leading varieties are being brought together from many parts of the world where grains are grown in a similar manner to the way they are grown in Ontario. Some of the varieties prove very successful while others prove to be total failures in our climate. All Ontario kinds are grown side by side with the foreign varieties for comparison. In oats, barley, spring wheat and peas, we have been successful in obtaining some very superior varieties, which had never been grown in Ontario previous to the time they were introduced by our station. The results given of these tests are certainly worthy of very careful study as, perhaps, in no other place in America, has there been so many varieties tested so carefully for such a length of time. The varieties which have made the best records have been grown in larger quantities and the seed distributed through the mail to the farmers of Ontario, or sold in larger quantities at moderate prices. Some fifteen thousand packages of choice seed have been sent out over the province during the past three years, and some of the varieties are being grown quite extensively. Nearly the whole of the grain grown upon the fields in the Farm proper, during 1893, was from seed supplied by the Experimental department, which was first grown upon the small trial plots, and from that again upon the larger plots The grain for sale is handled by the Farm department, of which Mr. Wm. Rennie is Superintendent.

Besides the varieties being grown in small plots, and the best ones again grown in larger plots, all varieties are grown in single rows with two hundred grains in each row. The rows are two rods long and one foot apart. This gives a grand opportunity to confirm the results of the same varieties upon the plots. The habits of growth of all kinds are studied quite closely, and when they can be found growing in different places and upon soil which varies slightly in character a much better opportunity is afforded to determine which variety is most affected by rust, which possesses the strongest straw, etc. From the single rows the collection is made for the autumn exhibitions at Toronto, London and other places. By this means the plots are left entirely undisturbed, and as the greatest accuracy is practiced in our plot work the results may be considered to be of a very reliable nature.

A considerable amount of work has been done in the selection of seed, and in our experience, up to date, we find that if much care is exercised in the selection of fine plump seed, year by year, the quality of the grain is almost sure to be of a superior class. A number of experiments are now being started to show the exact influence in sowing different grades of seed of various varieties of grain. This will also include different classes of farm crops. The experience of the past has shown that there is a very important work which should be carried out to ascertain to what extent crops can be improved by a very careful selection of seed year after year.

The Summer Rainfall.

During the summer of 1893, the weather was mostly favorable to our field experiments. There were occasional showers during each of the summer months in the vicinity of Guelph, although the total amount of rainfall was 1.78 inches less during the five summer months than the average of the previous six years. The amount of rainfall for May, June, July, August and September, during the last seven years was as follows:

Month	1887.	1888.	1889.	1890.	1891.	1892.	1893.
	inches.	inches.	inches.	inches.	inches.	inches.	inches.
May	1.58	1.08	3.59	2.18	.68	3.67	1.61
June	2.36	2.92	4.25	5.31	1.15	4.50	1.64
July	.61	2.21	2.67	1.44	3.54	3.15	1.89
August	2.71	2.16	1.92	1.74	3.96	3.15	3.83
September	1.52	1.55	1.04	.72	2.62	2.44	1.32
Total	8.78	9.92	13.47	11.39	11.95	16.91	10.29

FIELD PLOT EXPERIMENTS.

Barley, Comparative Test of 73 Varieties.

Seventy-three varieties of barley were tested in 1893. Of this number fifty-two were two-rowed, eleven six-rowed, and ten hulless varieties. Thirty-seven kinds were grown upon the experimental plots for five successive years, fourteen for four years, ten for three years, three for two years, and nine were grown in 1893 for the first time. They were all sown broadcast at the rate of one hundred pounds per acre, upon plots exactly $\frac{1}{100}$ of an acre in size. Equal amounts by weight of seed were sown upon the different plots. Seeding took place on May 6th with all the varieties, except Jarman's Selected Beardless and Jarman's Golden Champion, which were sown on May 10th. The land was a clay loam and had not received any manure for several years. The crop during 1892 was rape which was pastured off by lambs in the autumn. The yields per acre have been estimated from the actual yields of the plots.

YIELDS OF 63 VARIETIES OF SIX-ROWED AND TWO-ROWED BARLEY.

Varieties.	Number of rows per head.	Results for 1893.			Average for number of years grown.		
		Weight per measured bushel.	Straw per acre.	Grain per acre (bush. 48 lbs).	Weight per measured bushel.	Straw per acre.	Grain per acre.
Grown for five years:		lb.	tons.	bushels.	lb.	tons.	bushels.
1. Mandscheuri	6	50.5	1.53	53.3	50.7	1.75	**56.7**
2. French Chevalier	2	52.1	1.67	42.8	52.0	1.77	**51.8**
3. Oderbrucker	6	53.9	1.67	57.2	53 9	1.53	**51.4**
4. Scotch Improved	6	50.5	2.06	50.5	51.9	1.45	**51.1**
5. Empress	2	52.6	1.47	39.7	52.2	1.89	**50.2**
6. Two-Rowed Italian	2	53.0	2.03	65.5	52.6	1.93	**49.4**
7. Improved Cheyne	2	53.0	1.43	44.7	52.6	1.89	**49.2**
8. Thanet	2	54.1	1.38	41.7	52.5	1.80	**48.7**
9. Common Six Rowed	6	52.3	1.61	56.8	52.9	1.36	**48.7**
10. German Golden Drop	2	53.3	1.86	52.4	53.2	1.97	**48.2**
11. Improved Golden Melon	2	53.5	1.27	49.2	52.6	1.61	**48.1**
12. Selected Chevalier	2	53.3	1.32	36.8	52.2	1.86	**48.0**
13. Kalina	2	52.0	1.49	39.9	52.5	1.74	**47.9**
14. Early Black	6	52.3	1.50	58.2	50.4	1.50	**47.7**
15. Hallett's Pedigree	2	52.0	1.30	39.7	52.6	1.62	**47.7**
16. Improved Beardless	2	52.6	1.59	45.7	51.9	1.92	**47.4**
17. Peerless White	2	53.3	1.64	43.2	53.2	1.77	**47.2**
18. Kinna Kulla	2	54.0	1.77	55.5	51.5	1.79	**46.8**
19. Phœnix	2	53.3	1.37	41.7	53 1	1.71	**46.8**
20. Imperial	2	53.3	1.47	38.9	52.6	1.89	**46.6**
21. English Golden Drop	2	54.9	1.70	52.9	52.6	1.86	**46.4**
22. English Malting	2	52.9	1.61	45.3	52.6	1.84	**44.4**
23. Improved Imperial	2	49.6	1.86	43.5	47.2	1.97	**43.9**
24. Probsteier	2	54.6	1.43	44 5	53.2	1.65	**42.7**
25. Cheyne	2	52.3	1.58	42.6	52.0	1.68	**42.6**
26. Golden Melon	2	53.6	1.59	48.5	52.5	1.60	**42.6**
27. Invel	2	52.9	1.36	41.2	51.6	1.71	**41.8**
28. Beardless	2	53.2	1.19	46.4	51.9	1.68	**41.4**
29. Carter's Prize Prolific	2	53.9	1.45	44.7	53.0	1.97	**41.4**
30. Pfanen	2	52.9	1.23	41.9	51.6	1.61	**41.2**
31. Two-Rowed Spreading	2	50.3	1.26	34.6	49.9	1.45	**40.4**
32. Scotch Chevalier	2	52.6	1.95	28.1	52.8	1.67	**39.3**
33. Annats	2	52.5	1.09	34.7	51.4	1.66	**38.5**
34. Scholey's Chevalier	2	52.0	1.17	37.6	51.0	1.67	**38.1**
35. Italian Rice	2	50.2	1.11	28.4	50.4	1.50	**37.9**
36. Emperor	2	51.0	.98	24.9	51.1	1.72	**34.6**
37. Dutch	2	51.3	.85	28.1	48.4	1.53	**33.5**
Grown for four years:							
38. Australian	2	54.6	1.49	46 2	52.3	1.80	**51.4**
39. Early Minting	2	53.0	1.64	47.2	52.1	1.91	**50.4**
40. Cape	6	49.0	1.16	50.7	47.2	1.34	**50.0**
41. New Zealand Chevalier	2	53.6	1.39	43.0	52.8	1.92	**49.5**
42. Italian	2	51.3	1.44	40.9	54 6	1.86	**49.0**
43. Mensury	6	52.3	1.26	46.6	51.6	1.29	**48.4**
44. Diamond	2	51.5	.97	35.5	51.9	1.52	**42.2**
45. Very Early Lapland	2	48.0	.91	34.4	47.5	1.13	**39.6**
Grown for three years:							
46. California Brewing	6	47.1	1.05	44.6	45.4	1.48	**57.7**
47. Imperial Six-Rowed	6	51.5	1.60	58.0	52.2	1.47	**56.5**
48. Duckbill	2	51.3	1.16	32.9	51.9	1.72	**52.0**
49. Six Rowed Baxter's Improved	6	50.2	1.38	39.5	52.1	1.46	**52.0**
50. Highland Chief	2	52.5	1.20	39.7	51.9	1.73	**51.0**
51. California Chevalier	2	51.5	1.20	36.3	51.6	1.87	**50.6**
52. Salzer's California Prolific	2	51.0	1.45	29.2	52.3	1.68	**49.9**
53. Carter's Prize Prolific (imp)	2	53.5	1.46	39.3	52.5	1.75	**48.7**
54. Carter's Goldthorpe	2	52.0	.82	23.2	51.5	1.67	**47.4**
55. Martin West	2	53.3	1.18	34.1	54.3	1.53	**46.8**

YIELDS OF 63 VARIETIES OF SIX-ROWED AND TWO-ROWED BARLEY.

Varieties.	Number of rows per head.	Results for 1893.			Average for number of years grown.		
		Weight per measured bushel.	Straw per acre.	Grain per acre. (bush. 48 lb.)	Weight per measured bushel.	Straw per acre.	Grain per acre.
Grown for two years :		lb.	tons.	bush.	lb.	tons.	bush.
56. Gold Foil, Honsfords	2	52.6	1.03	32.6	51.8	1.87	**41.3**
57. Two-Rowed Canadian	2	50.9	.95	28.2	52.1	1.53	**37.3**
58. Selected Canadian Thorpe	2	50.5	1.84	24.2	50.8	1.42	**34.0**
Grown for one year :							
59. Vermont Champion		55.0	1.46	46.5	55.0	1.46	**46.5**
60. Four-Rowed	6	52.9	1.15	45.1	52.9	1.15	**45.1**
61. Black	2	52.0	1.31	40.4	52.0	1.31	**40.4**
62. Jarman's Selected Beardless	2	48.3	1.21	27.9	48.3	1.21	**27.9**
63. Jarman's Golden Champion		47.9	1.08	21.5	47.9	1.08	**21.5**

In 1893, the barley crop gave an average yield of 41.4 bushels of grain per acre and 1.39 tons of straw. This was somewhat below the average of the past five years, which shows a yield of 45.4 bushels of grain and 1.65 tons of straw per acre. The weight per measured bushel is, however, the reverse to this as the crop of the past year makes the best showing. In 1893 the averaged weight per measured bushel was 52.1 lbs., while that for the last five years was four-tenths of a pound less. Among the varieties tested some were of superior excellence, while others possessed qualities of a very inferior kind. A study of the results given in the table will show the great difference in varieties as regards both quality and quantity of grain produced. In the notes given below special attention is drawn to some of the best varieties.

Mandscheuri. Among thirty-seven varieties of barley, which have been grown in the comparative tests for the past five years, the Mandscheuri stands at the head of the list in yield of grain per acre. It is not at this station alone that this variety has done so well, but over the Province generally it has made an excellent record. In 1892 it was sent out along with five other kinds and tested in five different localities. Among these varieties it took the lead, and produced upwards of eight bushels per acre more than the next highest yielder. In no single test was it surpassed by any other variety. In the test at this station during the past five years it has given an average yield of eight bushels per acre more than the common six rowed, and 15.3 bushels per acre more than the Carter's Prize Prolific. The Mandscheuri is a six-rowed variety and possesses a straw which usually stands up well. It is a vigorous grower and seems quite well adapted to a variety of soils. The heads are a little more than three inches in length, compact, and produce about 45 grains each. In earliness it is superior to most other varieties, as in 1893, only 84 days elapsed from seeding time until harvest, and the average number of days to complete its growth during the past three years was 97. This variety came from Russia, and was imported by this station in the spring of 1889, with the name spelled as herein given. The grain somewhat resembles the Mensury which we obtained in Ontario four years ago, but it has given an average yield per acre of 14.5 bushels more than this kind in our comparative tests. The Mandscheuri seems to be better adapted for feeding purposes than for malting.

French Chevalier. The French Chevalier heads the list in yield among the two-rowed varieties grown for five years. It gives a weight of 52 lbs. per measured bushel for the number of years grown, which is 1.3 lb. more than the Mandscheuri. The yield per acre in 1893 was 42.8 bush., and during the past five years the average was 51.8 bush. The straw is long but is apt to lodge considerably in unfavorable seasons.

It is just one week later in ripening than the Mandscheuri. The heads are nearly five inches in length and produce an average of about 26 grains each. This variety did not do extra well over Ontario in 1892 in the co-operative tests, as among the six varieties tested the French Chevalier came at the bottom of the list in point of yield, but the results of all the kinds tested were not widely different.

Oderbrucker. This variety, which was imported from Germany in the spring of 1889, has made a good record. Not only has it given an average yield of 51.4 bushels of grain per acre for five years, but it has produced a grain weighing on an average 53.9 lb. per measured bushel. The weight per measured bushel in 1893 exactly corresponds with the average weight for five years. In the tests over Ontario in 1892, this variety stood second in point of yield among the six varieties, the Mandscheuri coming at the head of the list. It is a six-rowed variety and is a few days earlier than the Mandscheuri in reaching maturity. The average number of days during the past three years from seeding to maturity was only 92. Of the 63 varieties which have been grown for the past three years, none have shown themselves to ripen earlier than the Oderbrucker. The straw averages about 36 inches in height and is medium in strength. The heads measure only about 2½ inches in length, but they give an average of over 40 grains each.

Scotch Improved. The Scotch Improved is another six-rowed variety, the seed of which was obtained in Ontario five years ago. The yield of grain is not far different from the Oderbrucker, but the average weight per bushel is less by about two pounds. In 1893 the weight per measured bushel was 2.4 lb. less than that shown by the Oderbrucker. In earliness, it may be classed equal with the Oderbrucker and five days earlier than the Mandscheuri. The straw is usually fairly strong and there is but little tendency to rust.

Empress. This English variety has held its own well in the trial plots, and has produced a grain which has given an average of 52.2 lb. per measured bushel. It stands second in point of yield of grain among the varieties grown for five years, giving an average yield of 50.2 bushels. In maturity it is about two days later than the French Chevalier, occupying on an average 106 days from seeding time until harvest. The straw is usually pretty strong, although in some seasons there seems to be a tendency to lodge.

Two-rowed Italian. This is one of the finest two-rowed barleys which has been grown upon the experimental plots. It was imported from France in 1889, and has greatly improved year by year. In 1893, the yield of grain per acre was 65.5 bushels. This is the highest yield produced among the 63 varieties of six-rowed and two-rowed classes. As the crop stood on the plot, it was certainly very handsome, and the straw remained standing remarkably well until cut. The straw averaged over forty inches in length, and the heads measured 3¾ inches from end to end. The average weight per measured bushel for five years was 52.6 lb., and for 1893 it was 53 lb. It produces a large amount of straw which is usually quite free from rust.

Kinna Kulla. The Kinna Kulla barley is another variety which is making for itself a fine record. It is, perhaps, the strongest strawed barley, which has been grown at this station. It is very seldom that the smallest portion of a crop can be found that is lodged. The straw stands perfectly straight until harvest time, and as it is longer than that of any other sort which has been tested, this variety is usually selected as the finest appearing barley at this station. The average yield per acre for five years was 46.8 bushels of grain and 1.79 tons of straw, while the average weight per measured bushel for the same length of time was 51.5 lb. In 1893, the yield was 55.5 bushels per acre and the weight per measured bushel 54 lb. Among all the varieties grown for two years the two-rowed Italian stands first in point of yield of grain, and the Kinna Kulla comes next. The latter named variety is a two-rowed sort and was imported from Sweden in the spring of 1889.

Australian. This is a two-rowed variety which was imported from Germany in the spring of 1890, and has given an average yield of 51.4 bushels of grain per acre

for the past four years. The weight per measured bushel of this variety was 54.6 lb. in 1893 and 52.3 lb. during the past four years. The straw is quite short, being only 31 inches in length in 1893, and it is also somewhat inclined to lodge.

California Brewing. Among ten varieties which were grown upon the Experimental Grounds in 1890 for the first time, the California Brewing has given the largest yield of grain per acre; the average for three years being 57.7 bushels. The quality of the grain, however, has been quite inferior and the variety will likely be but little grown on this account.

Duckbill. This variety has also been grown three years and has proven itself to possess good qualities. The average yield per acre has been 52 bushels of grain, which has given an average weight of 51.9 lb. per measured bushel. The straw is long and usually quite strong. In the comparative tests at this station, the two-rowed Italian and the Kinna Kulla have made much better records than the Duckbill, and the Carter's Prize Prolific has made a showing much inferior to the Duckbill.

YIELDS OF 10 VARIETIES OF HULLESS BARLEY.

Varieties.	Number of rows per head.	Results for 1893.			Average results for number of years grown on plots.		
		Weight per measured bushel.	Straw per acre.	Grain per acre (bush. 60lb.)	Weight per measured bushel.	Straw per acre.	Grain per acre.
Grown for four years:		lb.	tons.	bush.	lb.	tons.	bush.
1. Hungarian	6	57.8	1.00	20.0	59.6	1.53	**40.2**
2. Black Hulless	6	60.0	1.55	22.5	63.5	1.59	**37.3**
3. Guymalaya	6	57.0	.93	21.4	58.4	1.16	**37.1**
4. Large Skinned	2	57.9	1.27	24.3	60.0	1.37	**27.8**
5. Skinless	6	60.2	.77	17.6	60.8	1.02	**24.6**
6. Three-rowed	6	59.8	.92	10.2	59.9	1.13	**23.1**
Grown for one year:							
7. Guy Mayle	6	62.5	1.15	43.23	62.5	1.15	**43.2**
8. Winnipeg No. 2	6	59.9	1.79	41.6	59.9	1.79	**41.6**
9. Purple	6	61.9	2.10	40.9	61.9	2.10	**40.9**
10. Smooth Hulless	6	62.0	1.47	39.4	62.0	1.47	**39.4**

During the past four years, six varieties of hulless barley were grown in the trial grounds. These were obtained from Hungary, Sweden, France, Germany, Australia and Ontario. In the spring of 1893, four other varieties were obtained from the Kansas Experiment Station. In working out the yield per acre, 60 lb. has been taken as the standard weight per measured bushel. The yields of the foreign varieties were exceptionally good up to the present year, but the results during 1893 reduced the average yields per acre considerably.

Hungarian. This variety was imported from Hungary, and has done well both at this station and over Ontario. In 1891, it was distributed along with five varieties of the six and two-rowed sorts, and the average results of the tests show the Hungarian to stand second in yield of grain per acre. It has a large light colored grain and a squarely built head of six rows. The straw is, perhaps, the strongest of the hulless varieties, but in unfavorable seasons the crop is apt to lodge considerably.

Black Hulless. The Black Hulless barley is now well known in some parts of Ontario, where it has been grown for some years. It is a good yielder of grain, showing an average of 37.3 bushels per acre for the past four years. The grain weighs heavier per measured bushel than any of the other Hulless varieties. The great weakness of the Black Hulless barley is the tendency of the straw to lodge. It is not uncommon to see the whole crop lying flat on the ground.

Peas, Comparative Test of 81 Varieties.

Eighty-three varieties of peas were grown in the Experimental Grounds during 1893. In 1891, the experiment with peas proved to be a complete failure on account of uneveness of germination. There were only twenty varieties grown in 1890, but thirty-six more were added to this number in 1892, and twenty-five more in 1893.

The grain was all sown with a grain drill made specially for plot work. There were ten tubes in the drill, and the tubes were 1 link (7.92 inches) apart. The quantity of grain used varied from 2 to 4.5 bushels per acre according to the size of the grain and the manner of growth of the various kinds. The soil was a clay loam and almost exactly the same as that used for the barley. The plots used in the tests were each 1-100 of an acre in size. Seeding of all varieties took place on the 6th and 8th of May, with the exception of the Common Grey, Nimble Taylor, Nine Pod, Partridge and Carter's Nimble, which were sown on the 11th of May. The yields per acre have been estimated from the actual yields given by the plots.

Yields of 81 Varieties of Peas.

Varieties.	Days to reach maturity, 1893.	Results for 1893.			Average results for number of years grown on plots		
		Weight per measured bushel.	Straw per acre.	Grain per acre.	Weight per measured bushel.	Straw per acre.	Grain per acre.
Grown for three years:		lb.	tons.	bush.	lb.	tons.	bush.
1. Early Britain	94	59.0	1.13	35.7	59.5	1.14	**36.2**
2. Prussian Blue	98	61.5	1.86	35.4	62.4	1.34	**35.4**
3. Mummy	95	62.3	1.35	33 3	63.3	1.54	**33.5**
4 White Wonder	93	60.9	1.04	33.8	62.4	1.04	**34.0**
5. Field	87	62.5	1.38	33 9	62.9	1.21	**32.8**
6. Brown	94	59.0	1.48	35.8	58.8	1.56	**32.6**
7. Princess Royal	95	58.1	1.40	38.2	59.8	1.17	**32.5**
8. Black Eyed Marrowfat	96	61.8	1 68	34.0	61.3	1.44	**32.3**
9. White Eyed Marrowfat	96	60.8	1.71	41.2	61.7	1.36	**32.0**
10. Early Racehorse	89	63 0	1 09	26.1	63.3	1.19	**30.3**
11. Multipliers	100	61.3	1.66	30.3	61.6	1.60	**30.1**
12. Blue	.....	59.5	.89	28.8	61.9	1 13	**30.0**
13. Sweet Jessie	91	62.5	1.30	28.5	62.3	.99	**25.3**
14. Glory	87	58.3	1.04	27.7	60.8	1.25	**24.8**
15. Perfection White	93	58.0	1.31	30.6	59.6	1.25	**24.7**
16. Selected Maple	77	63.5	.54	25.8	62.8	.64	**24.4**
17. Hero of Reading	87	58 2	1.31	26.4	60.1	1.14	**24.0**
18. Veitche's Perfection	94	55.0	1.15	19.9	55.2	1.14	**18.0**
19. Grass	109	63.8	2.10	25.8	63.5	1.81	**15.3**
20. Earliest of all Blue	80	62.3	.46	20.5	62.5	1.05	**14.1**
Grown for two years:							
21. Crown	98	62.0	.....	38.5	61.1	1.55	**35.9**
22. Canadian Beauty (No. 10, Rennie)	96	62.3	1.55	37.4	61.8	1.56	**35.8**
23. Fall White Marrowfat	95	61.3	1.51	33.1	60.9	1.73	**35.4**
24. Canada Cluster	95	62.0	1.61	34.8	61.4	1.87	**35.3**
25. Centennial	102	60.9	1.76	38.8	60.5	1.62	**35.3**
26. Golden Vine	93	61.3	1.70	35.0	61.1	1 68	**33.8**
27. Scotchman	106	62.0	2.03	34.0	61.9	2.06	**33.5**
28. Early June	95	62.0	1.49	31.9	62.1	1.45	**33.5**
29. Royal Dwarf Marrowfat	98	60.5	1.35	30.9	59.9	1.48	**32.6**
30. Cleveland's Advancer	98	61.0	1.22	27.8	60.4	1.41	**31.5**
31. McLean's Advancer	88	52.6	.89	28.6	53.4	.91	**31.3**
32. Champion of England	94	55.3	1.68	34.2	55.0	1.63	**30.3**
33. Early Maple	108	61.5	1.75	27.5	60.8	1.80	**27.9**
34. Sword	97	61.6	1.22	24.4	61.2	1.32	**26.9**
35. Sexton's Alpha	94	54.3	.98	22.4	54.4	1.21	**25.6**
36. Prince Albert	100	61.6	1.15	21.8	61.4	1.55	**25.5**
37. Telephone	93	53.4	1.15	21.8	53.4	1.26	**25.2**
38. Sugar	91	58.9	.89	30.3	58.6	.74	**24.5**
39. Philadelphia Extra Early	79	62.5	.65	22.9	60.8	.68	**24.0**
40. Canada Field	98	60.6	1.07	16.1	60.6	1.34	**23.9**

YIELDS OF 81 VARIETIES OF PEAS.—*Continued.*

Varieties.	Days to reach maturity, 1893.	Results for 1893.			Average results for number of years grown on plots.		
		Weight per measured bushel.	Straw per acre.	Grain per acre.	Weight per measured bushel.	Straw per acre.	Grain per acre.
Grown for two years:		lb.	tons.	bus	lb.	tons.	bush.
41. Tom Thumb	73	65.3	.55	28.3	63.4	.55	**22.5**
42. Prince of Wales	85	52.5	.75	17.4	52.3	.95	**22.2**
43. Cleveland's Rural New Yorker	75	62.0	.97	21.8	62.3	.83	**21.8**
44. Potter	93	60.8	1.28	27.5	60.5	1.10	**21.7**
45. Oakshott Field Pea	109	53.0	1.30	18.4	53.0	1.35	**21.5**
46. Cleveland's Alaska	76	62.3	.97	21 0	60.9	.79	**20.4**
47. Pride of the North	91	57.5	1.15	20.1	57.8	1.09	**19.8**
48. Telegraph	87	60.9	.80	16.9	59.5	.94	**19.8**
49. British Queen	100	54.0	1.31	23.1	53.3	1.36	**19.5**
50. Striped Wisconsin Blue	100	62.3	.83	15.5	62.0	1.30	**19.2**
51. McLean's Little Gem	87	57.8	.....	17.5	55.9	.68	**19.1**
52. Stratagem	92	54.5	.73	17.2	53 8	1.02	**19.0**
53. Anticipation	99	53.0	1.26	24.6	53.4	.92	**18.5**
54. Yorkshire Hero	99	59.0	1.81	21.2	54.8	1.44	**17.0**
55. Blue Peter	89	61.9	.64	13.8	59.4	.58	**11.8**
56. American Wonder	87	60.5	.30	9.8	56.5	.35	**8.5**
Grown for one year:							
57. Egyptian	101	61.3	1.13	35.8	61.3	1.13	**35.8**
58. Chancellor	84	62.5	1.48	33.9	62.5	1.48	**33.9**
59. William the First	85	60 8	1.00	33.2	60.8	1.00	**33.2**
60. Nine Pod	98	58.3	1.31	33.0	58.3	1.31	**33.0**
61. Common Grey	96	58.3	1.05	32.7	58.3	1.05	**32.7**
62. Nimble Taylor	96	58.5	1.19	31.2	58.5	1.19	**31.2**
63. White Imperial	94	61.3	1.34	30.3	61.3	1.34	**30.3**
64. Laxton's Supreme	95	54.8	.69	30.2	54.8	.69	**30.2**
65. French Canner	83	59.3	1.05	30.1	59.3	1.05	**30.1**
66. Laxton's Prolific Long Pod	89	61.1	1 06	29.8	61.1	1.06	**29.8**
67. Bruce's Early Conqueror	76	61.6	.63	28.3	61.6	.63	**28.3**
68. Kentish Invicta	80	62.0	.59	27.9	62.0	.59	**27.9**
69. D'Auvergne	92	60.3	1.16	27.9	60.3	1.16	**27.9**
70. Bliss Everbearing	89	58.0	.97	27.8	58.0	.97	**27.8**
71. Ne Plus Ultra	98	52.8	1.24	25.4	52.8	1.24	**25.4**
72. New Giant Podded Marrow	91	58.8	.79	25.4	58.8	.79	**25.4**
73. Carter's Lightning	74	62.3	.51	25.1	62.3	.51	**25.1**
74. Tall Turkish	90	59.3	.95	24 9	59.3	.95	**24.9**
75. Carter's First Crop	74	61.3	.45	23.3	61.3	.45	**23.3**
76. Long Island Mammoth	88	57.8	.82	22 8	57.8	.82	**22.7**
77. Laxton's Evolution	88	57.9	.88	22.2	57.9	.88	**22.2**
78. Carter's Nimble White	106	58.1	3.34	22.1	58.1	3.34	**22.1**
79. Dwarf Sugar Edible Podded	93	60.8	.70	21.6	60.8	.70	**21.6**
80. Hair's Dwarf Blue Mammoth	105	56.0	1.10	16.8	56.0	1.10	**16.8**
81. Partridge	77	63.8	.....	11.6	63.8	.....	**.6**

The same varieties which gave high yields of grain per acre in 1892, also made good yields during the past year. The best yield in 1893 was 41.2 bushels per acre, produced by the White-Eyed Marrowfat, and the poorest yield was 9.8 bushels per acre, produced by the American Wonder. This shows a variation of 31.4 bushels per acre. Of the 81 varieties grown in 1893 the Tom Thumb was the first to mature and the Grass and Oakshott Field varieties were the last to ripen. The first named variety took 73 days from seeding until harvesting, while the latter required 36 days longer. Notes are given below regarding some of the best varities for field cultivation.

Early Britain. The seed of this variety was first imported from England in 1889 by this station It is a variety which has made a good record since first grown upon our trial plots. The average yield per acre for three years was 36.2 bushels, and the yield for 1893 was 35.7 bushels. It has been quite uniform in yield throughout. The weight per measured bushel was 59 lb. in 1893 and for the three years it was 59.5 lb. on the average. The straw was long and about average in weight of all the varieties tested. The peas were of a brownish color, average size, and of a somewhat uneven surface. The number of days taken to reach maturity in 1893 was 94. The quality of the grain was only medium, but all things considered, the Early Britian has shown itself to be a good field pea.

Prussian Blue. The Prussian Blue pea is now known over many parts of Ontario, where it has been grown for a few years past. It is a good yielding variety, and also possesses a grain of good quality. The average weight per measured bushel for three years was 62.4 lb. It stands second in yield of grain per acre among the twenty varieties grown for three years. The straw is long and quite heavy. In color, the grain is, of course, blue, as indicated by the name. It is usually of good quality and of a plump smooth character. There were about five peas per pod in 1893, and the average length of pod was nearly three inches The Prussian Blue variety was about four days later than the Early Britain in reaching maturity.

Egyptian Mummy. In the western part of Ontario this variety of peas has been grown for several years. By some people it is very highly spoken of, while others speak of this variety with much disfavor. It possesses very peculiar straw, being quite angling in nature and heavy in weight. The average yield of straw for three years was 1.54 tons, and the weight per measured bushel of grain for the same length of time was 63.3 lb. The color of the grain is white and the surface smooth. This variety matures about three days earlier than the Prussian Blue does in some seasons, but usually the two kinds mature about the same time.

White Wonder. The White Wonder pea was imported directly from New Zealand by this station in the spring of 1890, and so far it has made a good record in the comparative tests. In the average of three years it has given a yield of only 2.2 bushels per acre less than the Early Britain, and it has produced a grain which weighed 1.9 lb. more per measured bushel than that of the Early Britain variety. The grain is white, medium size, smooth and plump. The straw is lighter than that of any of the varieties mentioned above, and is of good quality. The White Wonder is slightly earlier in reaching maturity than the Early Britain, Prussian Blue or Mummy.

Crown. No lengthy description need be given of the Crown pea as it is now known over many parts of the Province. It heads our list in point of yield of grain among thirty six varieties grown for two years, giving an average of 35.9 bushels per acre The peas are smooth, white, small and were of rather inferior quality in 1893. The average number of days to reach maturity during the past two years was 105.

Canadian Beauty. This variety was spoken of in the report of 1892 as "Rennie No. 10," and has now been named Canadian Beauty. It is a fine large, white, smooth pea, and stands second in yield per acre of the thirty varieties grown for two years. It produced an average of .110 bushel per acre less than the Crown in the two years. The weight per measured bushel was 61 8 lb. during the same length of time, while that of the Crown was 61 1 lb. Number of days to reach maturity was almost, if not exactly the same as in the case of the Prussian Blue.

Egyptian. The Egyptian is a pea differing very materially from all of the other varieties grown. The stems are quite upright in growth and branched out in the form of a tree. The seed was received from Mr. Hine, of Elgin County, Ont., who stated that it had been brought from Egypt a short time before. There were seldom more than one pea in a pod, but this one was large and plump. The yield of grain per acre was the largest of the twenty-five varieties grown in 1893 for the first time, being 35.8 bushels, and the weight per measured bushel was 61.3 lb. It took 101 days to reach maturity. This is certainly a peculiar, and at the same time, a promising variety. Careful experiments will be followed up with this pea from Egypt.

Spring Wheat, Comparative test of 73 Varieties.

No less than seventy-three varieties of Spring Wheat were tested in our Experimental Grounds during 1893. A large number of these varieties were imported from different countries, but all the Ontario kinds that could be obtained were included in the list. Of the seventy-three varieties, which are now in the test, twenty-two were grown for five consecutive years, while the rest have been grown for a shorter length of time namely, twenty-one varieties for four years, nine varieties for three years, ten varieties for two years, and eleven varieties for one year only.

The land upon which these varieties were tested in 1893 was similar to that used for the barley and the peas, except that it was slightly higher in situation. The treatment of the soil was also quite similar in every respect. The grain was sown broadcast at the rate of two bushels per acre, on plots 1-100 of an acre each. The plots were all exactly the same size, and the same quantity by weight of each kind of grain was sown upon its proper plot. Seeding of all varieties took place on April 29th with the exception of the Amythest, Champion Bearded, White, Australian, Early Scotch Bearded, Ruby, Ontario, Canadian Club, and Niagara, which were sown on the 9th of May. The yields per acre have been estimated from the actual yields given by the plots.

Yields of 73 Varieties of Spring Wheat.

Varieties.	Nature of Head.	Results for 1893.			Average results for number of years grown on plots		
		Weight per measured bushel.	Straw per acre.	Grain per acre.	Weight per measured bushel.	Straw per acre.	Grain per acre.
Grown for five years:		Lb.	Tons.	Bush.	Lb.	Tons.	Bush.
1 Herison Bearded	Bearded	60.3	2.78	30.7	62.7	2.0	**26.9**
2. Pringle's Champion	"	59.0	2.25	30.2	60.4	1.9	**24.9**
3. Bart Tremenia	"	61.9	2.14	37.0	62.6	1.7	**24.8**
4. Komisburg	"	60.3	1.88	30.5	61.7	1.6	**22.4**
5. Saxonka	"	60 5	2.33	30.1	60.3	1.7	**22.1**
6. Holben's Improved	Bald	56.8	1 96	22.2	58.5	1.8	**22 0**
7. Odessa Ghirka	"	59.0	2.24	28.6	59.7	1.8	**21.9**
8. Summer	Bearded	58.3	1 94	25.2	57.8	1.7	**21 6**
9. Ordinary Bearded March	"	57 8	1.82	24.3	58.0	1.7	**21.1**
10. Dantzic	"	59.5	1.86	27.9	56.7	1.5	**19 7**
11. Nenhert	Bald	57.0	1.71	22.9	55.5	1.6	**19.5**
12. King Bartigen	Bearded	57.3	1.73	23.9	57.6	1.6	**19.5**
13. Bearded Red	"	55.5	1.97	22.7	57.6	1.5	**18.1**
14. April Bearded Red	"	56 3	1.84	20.2	56.4	1.7	**17.4**
15. Red Bearded March	"	53.9	1.75	20.1	56.5	1.5	**17.4**
16. Ordinary March	"	55.3	1.97	20.2	55.5	1.5	**17.3**
17. March Debrie	Bald	54.5	1.70	16.6	55.6	1.8	**16.0**
18. French Summer	"	54 6	1.74	17.8	54.8	1.5	**16.0**
19. Chidham White	"	51 0	1.59	13.8	54.2	1.5	**15.5**
20. Large Flag	"	49 5	1 40	7.5	53.9	1.0	**11.3**
21. Hickling's March White	"	50 9	1.76	11.3	51.1	1.6	**10 9**
22. Lonzella White	"	47.0	1.69	8.8	50.7	1.5	**10.6**
Grown for four years:							
23. Red Fern	Bearded	59 8	2 54	33.8	61.2	2.1	**32.0**
24. White Russian	Bald	58 2	2.29	32.1	59.0	1.9	**29.6**
25. Wild Goose	Bearded	61 3	2.28	27.5	61.1	1.9	**28.1**
26 Red Fyfe	Bald	58 5	2.28	25.3	59.8	1.8	**25.4**
27. White Fyfe	"	56.0	1.96	21 3	61.9	1.5	**25.0**
28. Colorado	Bearded	58.3	2.61	27.0	60.0	1.6	**23.4**
29. Sorentino	"	58 8	2.60	30.8	59.5	1.6	**23.3**
30. Medesh	"	58.5	1.81	31.8	60.9	1.4	**23.2**
31. Mountain	Bald	58.0	2.47	22.6	58.5	1.7	**22.4**
32. Algiers	Bearded	56.0	2.63	29.3	57.7	1.7	**22.1**
33. Triumph	Bald	57.0	2.36	21.3	59.0	1.6	**22.0**

YIELDS OF 73 VARIETIES OF SPRING WHEAT.—*Continued.*

Varieties.	Nature of Head.	Results for 1893.			Average results for number of years grown on plots		
		Weight per measured bushel.	Straw per acre.	Grain per acre.	Weight per measured bushel.	Straw per acre.	Grain per acre.
Grown for four years:		Lbs.	Tons.	Bush.	Lbs.	Tons.	Bush.
34. Grecian	Bearded	57.3	2.27	26.1	57.4	1.7	21.7
35. Kubanka	"	61 5	1.80	25.0	.....	.....	21.5
36. Ladoga	"	56 5	1 07	24.2	57.0	1.3	20.5
37. Atalank	"	57.9	2.17	21.8	57.5	1.5	19.6
38. Paros	"	57 0	1.87	17.8	56.6	1.5	18.0
39. Neapel	"	61.1	2.00	17.1	53.5	1.6	17.3
40. V to	"	56.8	2.03	22.5	56.6	1.5	13.2
41. March White	Bald	58.0	. ..	17.2	56 1	.....	11.6
42. Square Head	"	54.0	2 42	14 8	53.7	1.5	9.6
43. Atrican	"	48.9	1.77	7.8	.....	1.1	5.0
Grown for three years:							
44. Rio Grande	Bearded	58.0	2.20	26.6	59.7	1.9	27.8
45. McCarlin	"	58.3	2.66	23.3	59.4	2.2	27.6
46. Okanagan Valley Velvet Chaff	Bald	57.6	2 01	26.3	58.2	1.8	25.9
47. Manitoulin	"	57.6	2 10	21.7	59 6	1.6	25.1
48. Sakatchewan Red Fyfe	"	57.0	1.97	23.5	59.5	1.7	24.4
49 Salzer's Assiniboia Fyfe	"	58.0	1.97	21.8	58.7	1.4	23.3
50. Washington	Bearded	59.0	1.86	22 9	59.4	1.5	22.7
51. Pringle's Defiance	Bald	57.2	1 65	15 8	58.7	1.4	20.2
52. Anglo-Canadian	Bearded	52.3	1.97	11.1	54.5	1.5	17.6
Grown for two years:							
53. Wellman Fyfe	Bald	57.3	2 35	30.2	58.6	2 2	28.5
54. Lost Nation	"	58.9	2 04	25.4	59.3	2.2	28.1
55. Velvet Chaff Blue Stem	"	56 9	1.92	26 9	57.9	1.8	26.3
56. Hayne's Blue Stem	"	55.6	1.86	26.3	57 6	1.8	25.2
57. The Mars	Bald	57.6	1 85	24.2	58.6	1.7	23.5
58. Manitoba Red	"	56 8	1.68	20 4	58.9	1.8	22.5
59. New York Spring Wheat	Bearded	57.8	1 61	20.6	58.3	1.7	22.0
60. Dakota Mawel	Bald	55.8	1 79	22 0	56.4	1.7	19.6
61. Magyar	"	57.0	1 66	20 4	56.5	1.6	16.9
62. Campbell's White Chaff	"	51.9	1 64	12 1	52.7	1.4	12.7
Grown for one year:							
63. Blue Democrat	Bearded	58.9	1 65	16.7	58.0	1.7	16.7
64. Amythest	Bald	56.8	1.29	16.2	56 8	1.3	16.2
65. Early Scotch Bearded	Bearded	57.8	1.38	15.7	57.8	1.4	15.7
66. Champion Bearded	"	56 5	1 63	14.9	56.5	1 6	11.9
67. Ontario	"	56.3	1.19	13.6	56.3	1.2	3.6
68. French Imperial	Bald	56.5	1 07	11 0	56.5	1.1	11.0
69. Canadian Club	"	55.0	.....	10.2	55 0	.....	10.2
70. Scotch Fyfe	"	56.3	.91	6.1	56.3	.9	6.1
71. Niagara	"	49 2	1.04	5.4	49.2	1.0	5.4
72. White Australian	"	47 5	3 31	4 8	47.5	3.3	4.8
73. Ruby	"	.. ..	.87	2 6	.....	.9	2.6

The spring wheat crop of 1893 was exceptionally good. The straw was quite free from rust, and the crop on most of the plots stood up well until harvest time. The average yield per acre of the seventy three varieties was 21.1 bushels of grain and 1.92 tons of straw. The average weight per measured bushel of the grain was 56.5 lb. The greatest yield of grain per acre was produced by the Wild Goose, 37.5 bushels, and the poorest yield was given by the Ruby, 2.6 bushels, thus making a variation of 34.9 bushels per acre. Some of the foreign varieties have made an excellent showing in the comparative tests, both in yield and in quality of grain.

Herison Bearded. The Herison Bearded variety was imported from France in the spring of 1889, and has thus been grown in the trial grounds for the past five years.

During this time it has given an average yield of 26.9 bushels per acre and an average weight per measured bushel of 62.7 lbs. This record shows the Herison Bearded to stand first, both as regards yield of grain per acre and weight of grain per bushel, among the twenty-two varieties grown for the same length of time. It is a bearded sort and has a club-shaped head. The straw is usually stiff and grows to an average of about 40 inches in length. It is seldom affected by rust to any marked degree. The grains are of a deep red color and are quite small in size, but plump. In 1892 this variety was sent out over Ontario along with five other varieties of spring wheat. The reports from thirty-five different experimenters showed the Herison Bearded to come third in the list in point of yield of grain, giving an average of 18.3 bushels per acre.

Pringle's Champion. This German spring wheat has done well on this farm for the past five years. In regard to yield of grain per acre it stands next to the Herison Bearded, but produces a grain which is over two lbs. lighter per measured bushel; it is, nevertheless, above the standard weight per bushel, as the average for five years shows it to be 60.4 lb. It is also a red grained sort. The head is more than twice the length of the Herison Bearded and the grains are also much larger. The number of grains per head is usually large, being upwards of 27 in 1893. It has a straw of good strength, which is comparatively free from rust. It is about one day earlier than the Herison Bearded in reaching maturity.

Bart Tremenia. The Bart Tremenia, which was imported from Greece in 1893, has improved year by year until it now holds third place in point of yield of grains among the twenty-two varieties grown for five years. The average yield of grain per acre has been only one-tenth bushel less than that of the Pringle's Champion, and the average weight per bushel one-tenth of a pound less than the Herison Bearded. It is a strong grower, almost free from rust, and possesses a squarely built bearded head. The grain is very large and rather coarse in character. This variety somewhat resembles the Wild Goose wheat, which has been grown in Ontario for some time.

Red Fern. Among the twenty-one varieties grown on the plots in 1890, for the first time the Red Fern has given the largest average yield of grain per acre. This variety, which is quite well known over Ontario, has certainly done well in our comparative tests. The average yield of grain per acre was 32 bushels, and the average weight per bushel 61.2 lb. It is one of the greatest producers of straw of all the varieties tested, and the straw is of a fairly good quality, being affected but slightly with rust, and usually standing well until harvest time. It has a long bearded head and a fairly large red grain. In earliness of maturity it is about similar to the Herison Bearded, Pringle's Champion and Bart Tremenia, taking 106 days from date of seeding until time of ripening.

Rio Grande. This is a somewhat coarser wheat than the Red Fern, but is, nevertheless pretty generally liked by the millers. It has produced an average of 27.6 bushels per acre for three years, which places it at the head of the list of those grown for that length of time. In quality it is not up to the other varieties mentioned, as in three years the average weight per bushel was only 59.7 lb., and in 1893 it did not exceed 58 lb. It is a strong growing, bearded variety, and is usually fairly free from rust.

Wellman Fyfe. Ten new varieties were grown in the trial plots in 1893 for the first time, the greater number of which were obtained from the United States. The Wellman Fyfe took the lead in production of grain in 1892 and 1893 among these newer sorts, but the weight of grain per bushel has fallen below the standard by 14 lbs. It has a bald head with a white velvety chaff. It has been one of the freest from rust of all the varieties grown.

Winter Wheat, Comparative Test of 52 Canadian and American Varieties.

The following report of Winter Wheat was prepared by Prof. Shaw and myself, and was issued in August as Bulletin xc:

The principal object of this bulletin is to furnish information to the farmers in an easily accessible form, which they can turn to good account when determining the varieties of winter wheat to be sown the present season. This information relates to behavior of certain varieties of winter wheat grown at this station for one, two, three and four years respectively and under similar conditions. It furnishes important particulars relating to various characteristics and peculiarities of growth which have important bearing on the adaptability of soils to certain varieties. These particulars are probably of more value than the comparative yields, which are also given in the bulletin.

It has been our aim during recent years to grow all the Canadian and American varieties of any promise, the seed of which we have been able to obtain. The question has in consequence been raised as to the advantage that can accrue from continuing the test with so many varieties, many of which are not likely to come into prominence. We answer that our principal aim is to prevent them from coming into prominence, and by so doing to furnish a safeguard to the farmers. Whenever the attempt is made by designing men to palm off a variety as new and superior, we have a ready means of comparison at hand for detecting the imposture as to name and properties. Could this work have been done years ago the Red Lion wheat swindlers could not have taken such large sums from unsuspecting farmers as they did in certain counties of Ontario. Many farmers at the time paid as high as $15.00 per bushel for the seed. In our experience it has proved one of the least satisfactory of all the varieties grown. If farmers will but heed carefully the work that is being done at the experiment stations in this country, the trade of the seed grain swindler cannot flourish again.

Desirable Qualities. The qualities to be sought in winter wheat include the following: (1) Ability to give good yields; (2) the quality of the grain, including weight per bushel and value for milling purposes; (3) strength of straw; (4) non-ability to rust; (5) earliness in maturing; (6) the presence or absence of beards.

Location and Soil. All the varieties, both native and foreign, were grown side by side in ranges separated only by temporary roads. The plots in these ranges contained each exactly one one-hundredth of an acre. The yield per acre is estimated from the actual yield of the plots. The land may be termed level, and yet it was somewhat elevated, occupying as it did the highest part of a field, the whole of which may be said to be high-lying. The soil may be designated a mild clay loam.

Preparation of the Soil. The soil was prepared on the bare fallow system to secure uniformity of condition. This was the only bare fallow that we had upon the farm except a small portion also under preparation for experimental work. The cultivation given was much the same as is usually put upon bare fallows. Barnyard manure was applied at the rate of 15 tons per acre in the spring of 1890, and a crop of rape was grown and pastured off upon the land the same year. In 1891 a grain crop was grown. No manure has been put upon it since 1890.

Selection of Varieties. In selecting varieties to sow, those kinds should be preferred which have given the most satisfaction during a term of years rather than for one year. Sometimes varieties do well for one year or more, and then cease to do so well thereafter. We are now able to give facts relating to the behavior of a considerable number of varieties for four years, as shown in Table II. The aim should also be to adapt the variety to soil conditions, the more rugged and less refined varieties being better adapted to the less productive soils than the more refined sorts.

The Varieties Grown. There were in all 153 plots grown at the station during the present year, including 70 varieties. Of these, 11 of the leading varieties were grown in triplicate plots. Of the 70 varieties grown, 52 were Canadian and American, and 18 were foreign. The foreign varieties which were imported originally from Germany, England, France and Russia in 1889, are all from last year's seed. As none of these kinds have as yet proved equal to some of the best of the Canadian and American varieties, and as many of them do not ripen sufficiently early to be reported upon in the bulletin with the latter, we do not feel justified as yet in recommending the farmers to grow them. This bulletin, therefore gives the particulars relating to 52 Canadian and American varieties grown under the same conditions.

Manner and Time of Seeding. The seed was sown by hand at the rate of $1\frac{2}{3}$ bushels per acre by weight. The plots were all sown on September 3rd, with the exception of Nos. 45, 46, 48, 50 and 52, which were sown on September 9th.

The Conditions of Season and Weather. The varieties, speaking in general terms, came through the winter exceptionally well. The spring following was cold and backward, insomuch that growth was hindered somewhat seriously for a time. Eventually, however, the growth was rapid and the ripening early rather than late. During the ripening period the best development of the grain was hindered by unduly warm weather.

TABLE I GIVES THE CHARACTERISTICS OF 52 VARIETIES OF WINTER WHEATS:

Varieties.	Nature of head.	Color of		Date of maturity.	Height of plants.	Comparative amount of rust, 0 – none, 100 much.	Per cent. of straw lodged at harvest.
		Chaff.	Grain.	July.	Inch.		
1 Surprise	Bald	White	White	22	50.5	30	30
2 Early Red Clawson	"	Red	Red	20	49.0	35	60
3 Golden Drop	"	"	"	20	48.0	35	60
4 Golden Cross or Volunteer	Bearded	"	"	24	51.0	50	10
5 Red Velvet Chaff	Bald	White	Red	23	54.0	25	20
6 Rogers	"	"	"	25	53.5	45	15
7 Hybrid Mediterranean	Bearded	Red	"	22	51.0	55	3
8 Bonnell or Landreth	Bald	White	White	25	53.0	28	10
9 Manchester	"	"	Red	26	51.0	45	5
10 Martin Amber	"	"	White	27	52.5	43	5
11 Standard	"	Red	"	25	50.0	55	10
12 Lancaster	Bearded	"	Red	23	50.0	33	80
13 Seneca or Clawson	Bald	"	White	24	48.5	45	10
14 Red Lion	Bearded	"	Red	24	51.0	40	80
15 New Monarch	Bald	White	"	23	52.0	50	10
16 American Bronze	"	"	"	23	52.5	58	3
17 Egyptian	Bearded	"	"	22	50.5	48	10
18 Jones' Winter Fife	Bald	"	"	21	49.5	33	3
19 Bulgarian	Bearded	"	White	23	48.5	33	3
20 Canadian Velvet Chaff	Bald	"	"	25	48.0	33	0
21 Garfield or Natural Cross	"	"	"	25	53.0	43	3
22 Winter Pearl	"	"	"	27	48.5	35	0
23 Democrat	Bearded	"	"	21	48.0	43	0
24 Dawson's Golden Chaff	Bald	Red	"	23	46.0	60	0
25 Mediterranean	Bearded	White	Red	22	46.0	43	3
26 Reliable	"	"	"	22	45.5	40	0
27 Deitz Longberry	"	"	"	21	47.5	48	0
28 Coryell	Bald	Red	"	20	40.5	48	0
29 Russian Amber	Bearded	White	"	23	42.5	33	0
30 Rutherford	"	Red	"	23	46.0	58	0
31 Red Wonder	"	White	"	22	47.5	45	0
32 Walker's Reliable	"	"	"	22	44.0	63	5
33 Fulcaster	"	"	"	25	45.0	43	0
34 Rumsey	"	"	White	22	45.0	43	0
35 Valley	"	"	Red	22	44.0	40	0
36 Longberry Red	"	Red	"	23	44.5	33	5
37 Fultz	Bald	White	"	21	43.5	53	0
38 Velvet Chaff	Bearded	Red	Red	22	40.0	60	0
39 Genesee	"	White	White	23	46.0	63	0
40 Monette	Bald	"	Red	25	41.5	40	3
41 Hybrid Delhi	"	"	White	26	42.0	50	0
42 Manilla	"	"	"	27	43.5	45	0
43 Scott	"	"	Red	25	44.0	43	0
44 Red Russian	"	Red	"	25	44.0	43	0
45 South Sea	"	"	White	22	45.0	25	0
46 White Leader	"	White	"	24	48.0	68	0
47 Eureka	"	"	"	22	50.5	58	0
48 Soule's	"	"	"	24	49.0	58	0
49 Stewart's Champion	"	"	Red	24	54.0	53	0
50 White Star	Bearded	Red	"	24	48.0	38	0
51 Treadwell	"	White	White	24	49.0	50	0
52 British Columbia	Bald	Red	Red	26	47.0	75	0

It will be observed that of the 52 varieties in the above table the early Red Clawson, Golden Drop and Coryell were the first to mature Only seven days elapsed between the maturing of the earliest and the latest varieties The amount of rust, generally speaking, was slightly greater than last year. A majority of the varieties did not lodge to any extent, and yet the Lancaster and Red Lion were badly lodged. The Early Red Clawson and Golden Drop also lodged considerably. The Surprise crinkled down much more than in previous years, and this complaint seems somewhat general the present season, in regard to this variety.

TABLE II GIVES YIELDS OF 15 VARIETIES FOR FOUR YEARS:

Varieties.	Straw per acre (tons.)		Weight per measured bushel (lb.)		Grain per acre (bush. 60 lb.)	
	1893.	Average 4 years, 1890 93.	1893.	Average 4 years, 1890-93.	1893.	Average 4 years, 1890 93.
1 Surprise	2.7	2.72	57.8	59.90	42.6	45.43
2 Early Red Clawson	3.2	2.72	56.5	59 05	40 3	44.36
3 Golden Drop	3.3	2.73	60.5	61.70	42.7	42.66
4 Golden Cross or Volunteer	2 9	2.61	59.3	60.80	41.5	41.81
5 Red Velvet Chaff	3.6	2.77	56.8	59.80	36.3	41.20
6 Rogers	2.8	2.60	59.5	60.70	34.9	41.15
7 Hybrid Mediterranean	3.0	2.78	59.3	60.16	40.6	40.55
8 Bonnell or Landreth	2.6	2.72	56 9	59.75	33.7	39 90
9 Manchester	2.4	2.46	58.5	61.13	34.7	39.55
10 Martin Amber	2.4	2.60	58.3	60.48	33.8	38.50
11 Standard	2.4	2.64	55.7	59.08	31.4	38 30
12 Lancaster	2.6	2.80	60.2	62.00	35.5	38 23
13 Seneca or Clawson	2.3	2.66	57.8	59.60	33.6	37.96
14 Red Lion	2.6	2.75	60.0	61.28	36 7	37 89
15 New Monarch	2.4	2.47	58.1	59.98	30.9	33.21

As the facts given in Table II. relate not only to results of this year's crop, but also to the average obtained for the past four years, they may be regarded as of special importance. The average yield of grain per acre of these fifteen varieties was 30.9 bush in 1890, 51.6 bush. in 1891, 41 bush. in 1892 and 36.6 bush. in 1893. For the four years the average was 40 bush. The average weight per bush. in 1890 was 60 lb.; in 1891, 63.3 lb.; in 1892, 60 lb., and in 1893, 58 lb. For the four years the average was 60.4 lb. The Surprise again heads the list among 15 varieties grown for four years, and also stands second among the 44 varieties grown in 1893. It will be remembered that this variety is possessed of good milling properties. The Early Red Clawson follows closely with an average yield of 44 4 bush per acre. Its earliness in ripening is a strong point in its favor. The Golden Drop which stands third in the above table gave the highest yield per acre of all the Canadian and American varieties grown in 1893, and in 1892 it stood at the head of the list in point of yield along with Dawson's Golden Chaff, the yields of the two being equal. The Golden Drop, as already stated, is also one of the earliest varieties.

TABLE III GIVES YIELDS OF 8 VARIETIES FOR THREE YEARS:

Varieties.	Straw per acre (tons.)		Weight per measured bushel (lb.)		Grain per acre (bush. 60 lb.)	
	1893.	Average 3 years, 1891-93.	1893.	Average 3 years, 1891-93.	1893.	Average 3 years, 1891-93.
16 American Bronze	3.0	2.85	55.1	59 10	36 0	46.99
17 Egyptian	2.9	2.71	58.6	61.33	38.2	46 33
18 Jones' Winter Fife	2.4	2.23	58.0	60.17	35.9	43 36
19 Bulgarian	2.2	2.28	61.1	62.37	34 7	42.89
20 Canadian Velvet Chaff	2.5	2 42	56 8	58.13	34.0	41.54
21 Garfield or Natural Cross	2.0	2.46	57.9	59.40	26.6	41.14
22 Winter Pearl	2.1	2.48	59.7	60.37	30.5	40 71
23 Democrat	2.1	2.31	59.5	61.97	29.3	39.36

These varieties have been grown here for three years, and like those of the previous table, under the same conditions. The average yield obtained from them in 1891 was 55.3 bush. per acre ; in 1892, 39.9 bush. ; in 1893, 33.2 bush. ; for the three years, 42.8 bush. The average weight per measured bush in 1891 was 63.2 lb. ; in 1892, 59.9 lb ; in 1893, 58.2 lb. ; for the three years, 60.4 lb. The American Bronze, although still at the head of the list, does not seem well able to maintain the relative position which it gained in 1891. Its light weight per bushel and its rust tendencies tell somewhat against it, but it is a vigorous grower and stands up well. The Egyptian, though an old variety, has done very fairly. The Jones' Winter Fife which comes third in point of yield stands higher relatively this year than previously. First class milling properties are claimed for it. The Bulgarian, which bears considerable resemblance to the Democrat, yields fairly and weighs well. The Canadian Velvet Chaff gave a fair yield per acre, but the grain was exceptionally light in weight.

TABLE IV GIVES YIELDS OF 21 VARIETIES FOR TWO YEARS.

Varieties.	Straw per acre (tons).		Weight per measured bushel (lb.).		Grain per acre (bush. 60 lb.).	
	1893.	Average 2 years, 1892-93.	1893.	Average 2 years, 1892-93.	1893.	Average 2 years, 1892-93.
24 Dawson's Golden Chaff	2.3	2.90	57.4	58.5	38.1	45.66
25 Mediterranean	3.0	3.19	61.0	61.4	30.4	40.65
26 Reliable	2.1	2.62	60.2	61.2	31.6	39.76
27 Deitz Longberry	1.9	2.63	61.5	61.7	30 2	39.46
28 Coryell	1.7	2 27	62.7	62.1	31.6	38.89
29 Russian Amber	2.0	2.59	60.7	61.2	29 0	37.83
30 Rutherford	1.8	2.73	58.2	59.0	29.1	37.64
31 Red Wonder	1.7	2.94	61.2	62.0	25.7	37.26
32 Walker's Reliable	2.1	2.39	59.6	60.0	31.3	37.08
33 Fulcaster	1.5	2.39	61.2	62.9	23.4	36.94
34 Rumsey	1.8	2.57	59.7	60.6	27.5	36.30
35 Valley	1.8	2.19	58.7	60.1	26.1	34.90
36 Longberry Red	1.7	2.53	60.0	60.5	27.2	34.79
37 Fultz	1.2	2.14	60.9	61.7	20.0	33.72
38 Velvet Chaff	1.5	2.26	60.7	61.9	26.1	33.30
39 Genesee	1.5	2.47	58.5	59.8	22.1	32.94
40 Monette	1.5	2.41	58.0	58.5	22.7	32.38
41 Hybrid Delhi	1.2	2 04	56.1	57.8	19.5	31.17
42 Manilla	1.5	2.54	54.6	56.4	22.1	30.34
43 Scott	1.5	2.08	57.8	59.4	22.9	27.71
44 Red Russian	.8	1.99	56.1	58.8	7.9	24.64

The varieties in Table IV have been grown here for but two years. Considerably more than half the number were imported from the United States. The average yield per acre in 1892 was 44.7 bush. ; in 1893, 25.9 bush. ; for the two years, 35.3 bush. The average weight per measured bushel was 61.3 lb, and in 1893, 59.8 lb. ; for the two years, 60.5 lb. The Dawson's Golden Chaff, originated in 1881, by Robt. Dawson, of Paris, Ont., comes first in point of yield. It is exceptionally strong in the straw, but has some rust tendencies. The average yield per acre for two years has been 5 bush. in advance of the variety next on the list. The old Mediterranean, imported from the United States, comes second in point of yield, showing that it still retains its old time vitality. The Coryell, previously mentioned as one of the three earliest varieties, gave the heaviest weight per measured bushel of the 52 varieties grown in 1893.

TABLE V GIVES YIELDS OF 8 VARIETIES FOR ONE YEAR ONLY.

Varieties.	Straw per acre, 1893 (tons).	Weight per measured bushel, 1893 (lb.).	Grain per acre, 1893 (bush. 60 lb.).
45 South Sea	1.1	60.0	31.0
46 White Leader	1.7	54 6	30.1
47 Eureka	1.9	56.1	27.7
48 Soule's	1.9	54.0	26.2
49 Stewart's Champion	2.5	56.0	25.8
50 White Star	.9	58.8	25.1
51 Treadwell	1.2	57.1	16.5
52 British Columbia	1.5	53.3	15.0

The eight varieties in Table v were grown here this year for the first time in these comparative tests. None of them have given very high yields. The South Sea variety bears a very close resemblance to the Seneca or Clawson, insomuch that they be one and the same sort. The White Leader, very recently introduced, stands second in point of yield. It is one of the lighest weighing wheats in the list of varieties mentioned in the above table. The Soules and Treadwell will be remembered as old standard varieties. The behavior of neither of them was such as to sustain the old time prestige, more especially the Treadwell, with which the yield was very low.

TABLE VI GIVES COMPARATIVE SUMMARY OF RESULTS.

Classes of Grain.	Number of varieties.	Average yield of straw per acre (tons).		Average weight per measured bushel (lb.).		Average yield of grain per acre (bush. 60 lb.).	
		1893.	Average 2 years, 1892-93.	1893.	Average 2 years, 1892-93.	1893	Average 2 years, 1892-93.
Bald	24	2.24	2.77	57.8	58.7	31.0	35.6
Bearded	20	2.14	2.66	60.0	60.8	30.8	38.2
White Chaff	30	2.15	2.66	58.7	59.6	29.9	36.1
Red Chaff	14	2.30	2.83	58.9	59.8	33.0	38.3
White Wheat	15	2.10	2.67	57.8	58.7	30.7	35.3
Red Wheat	29	2.24	2.74	59.3	60.2	31.0	37.5

It will be observed that the average per measured bushel of the 20 bearded varieties for two years was 2.1 lb. more than that of the 24 bald varieties. The 29 varieties of red wheat weighed on an average 1.5 lb. per measured bushel more than the 15 varieties of white wheat. During the two years the bearded varieties gave an average yield of 2.6 bush. per acre more than the bald varieties; the red chaff varieties 2.2 bush per acre more than those with white chaff; and the red wheats 2.2 bush. per acre more than the white wheats. These years have not been really first-class wheat years, and this doubtless has had an important bearing on these results.

TABLE VII GIVES YIELDS OF 4 VARIETIES OF WINTER WHEAT SOWN AT DIFFERENT DATES:

Dates of Seeding.	Weight of grain per measured bushel (lb.).				Yield of grain per acre. (bush. 60 lb.)			
	Dawson's Golden Chaff.	Early Red Clawson.	American Bronze.	Surprise.	Dawson's Golden Chaff.	Early Red Clawson.	American Bronze.	Surprise.
August 26th	57.5	57.3	57.8	57.3	31.1	26.3	24.2	22.3
September 2nd	57.3	56.1	57.5	55.8	28.6	19.4	24.4	15.3
September 9th	55.3	55.8	55.6	54.3	25.8	21.5	20.8	15.1
September 17th	48.8	50.1	47.8	49.8	15.1	14.3	10.9	10.8

In the above table four leading varieties of winter wheat were sown at different dates, to test the effect upon the yields. It will be noticed in almost every instance the first date of seeding, viz.: 26th August, gave the best yields, and that these yields decreased, generally speaking, with each seeding at a later period. These results may have been influenced by the soil, which had grown grain for two years previously. It should also be borne in mind that latitude has much to do in determining the best season at which to sow winter wheat. The varieties in this list have given the following average yields per acre from all the different dates of seeding, viz.: Dawson's Golden Chaff, 25.1 bush.; Early Red Clawson, 20.4 bush.; American Bronze, 20.1 bush.; and Surprise, 15.9 bush. The average yields per acre from the different dates of seeding are as follows: August 26th, 26 bush.; September 2nd, 21.9 bush.; September 9th, 20.8 bush., and September 17th, 13.8 bush. The average weight per measured bushel at the above dates was as follows: August 26th, 57.5 lb.; September 2nd, 56.7 lb.; September 9th, 55.3 lb., and September 17th, 49.1 lb.

Distribution of Seed.

No varieties of winter wheat are kept for sale this year at the Experimental Farm.

In the subjoined table will be found the different sets of varieties of wheats which will be sent free by mail, in half-pound lots of each variety, to farmers applying for them, who will be able to test them carefully and report the results after harvest. The seed will be sent out in the order of the applications received so long as the supply lasts.

Two Sets of Winter Wheat for Co-operative Tests.

I.	II.
Dawson's Golden Chaff.	Dawson's Golden Chaff.
Golden Drop.	Surprise.
Early Red Clawson.	Jones' Winter Fife.
Bulgarian.	White Leader.
American Bronze.	Early Genesee Giant.

Each farmer wishing one of these sets will please write to the Secretary, C. A. Zavitz, Experimental Farm, Guelph, *mentioning which set he desires*, when the grain, with instructions for testing and blank forms on which to report, will be forwarded free of cost to his address, until the limited supply becomes exhausted.

Conclusions.

The results of the experiments may thus be summarized:

1. That the average yields per acre of the 52 Canadian and American varieties grown in 1893 were straw, 1.9 tons; grain, 30 bush., and weight per measured bushel, 58.2 lb.

2. The five best yielding varieties for 1893 were the following: Golden Drop, 42.7 bush. per acre; Surprise, 42.6 bush.; Golden Cross, 41.5 bush.; Hybrid Mediterranean, 40.6 bush., and Early Red Clawson, 40.3 bush.

3. The five varieties which gave the heaviest weights per measured bushel in 1893 were the Ceryell, 62.7 lb.; Deitz Longberry, 61.5 lb.; Fulcaster, 61.2 lb.; Red Wonder, 61.2 lb., and Bulgarian, 61.1 lb.

4. That in our experience of the past four years, the average yields per acre of the white and red wheats have been almost exactly the same.

5. That in our experience of the past three years, we have found that the red wheats average from 1½ to 2 lb. more per measured bushel than the white wheats.

6. That in our experience the past year, in sowing varieties of wheat at different dates, we have found that in every instance the earlier sown plots have given the best results.

Winter Wheat, Comparative test of 17 Foreign Varieties.

All the foreign varieties of winter wheat were grown in 1893 for the fourth time on this Farm. The conditions regarding the quality of land, size of plot, etc., used for the foreign varieties were the same as those given for the Canadian and American varieties. The seeding also took place at the same time. As most of the varieties are later in maturing than the Canadian kinds, they were not included in winter wheat bulletin issued in August last.

Yields of 17 Varieties of Foreign Winter Wheat.

Varieties.	Country obtained from.	Results for 1893.			Average results for number of years grown on plots.		
		Weight per measured bushel.	Straw per acre.	Grain per acre.	Weight per measured bushel.	Straw per acre.	Grain per acre.
Grown for four years:		lb.	tons.	bush.	lb.	tons.	bush.
1 Square Head	Germany	46.3	.49	5.0	54 3	.....	**31.1**
2 Dividend	Germany	41.8	.94	3.7	51.8	2.43	**25.5**
3 Spalding Red	England.	59.8	.69	10.5	58.1	1.70	**25.0**
4 Regent	Germany	50.6	2.09	21.6	54.9	.....	**24.4**
5 Lamed Hybrid	France..	50.8	.44	3.3	56.0	1.62	**23.8**
6 White Patanelle	France..	47.0	1.29	6.8	54.2	1.89	**23.2**
7 Russian Odessa	Russia...	.....	.20	1.3	.....	1.56	**22.9**
8 Golden Drop, Red	Russia...	.....	.44	1.6	.....	1.48	**22.9**
9 Imperial Velvet Chaff	England.	.....	.47	1.1	.....	.....	**22.5**
10 Square Head, Red	England.	.....	.....	5.0	.....	.....	**21.8**
11 Herfordshire, White	England.	.....	.78	2.3	.....	1 55	**20.7**
12 Browick, Red	England.	47.8	.89	5.1	54.6	1.68	**19.4**
13 Lammas, Red	England.	48.3	1.00	4.7	55.1	1.73	**19.0**
14 Saumur	France..	48.0	1.15	8.2	54.6	1.62	**18.9**
15 Red Inversible	France..	52.0	1.50	15.5	56.5	1.65	**18.7**
16 Kessingland, Red	England.	43.0	1.27	6.1	51.3	.....	**18.0**
17 Galezian Summer	Germany	52.0	.52	5.9	57.6	1.26	**17.1**

The foreign varieties of winter wheat did very poorly during the past season. Out of the seventeen varieties grown, only three gave a yield of 10 bushels per acre. They were nearly all badly killed during the previous winter. Some of the varieties possess a number of excellent qualities such as freedom from rust, strong straw of good quality, etc. These wheats have been killed out more or less each winter since their importation. It was thought, however, that by growing them for a few years in the Canadian climate they would gradually become more hardy, and in time might prove themselves to be valuable sorts for growing as a general crop. Some of the varieties of barley and some of oats improve year by year. For instance the Italian and two-rowed and the Kinna Kulla barleys only produced moderate yields when they were first introduced, but for the past two years they have surpassed all the other varieties grown, and are becoming of great usefulness.

Oats, Comparative test of 133 Varieties.

There are many varieties of oats in the market at the present time. Some of them of course resemble each other very closely, and might be considered as being the same varieties. There are, nevertheless, a large number of prominent characteristics which go to separate one kind from another. In the list of oats grown upon the trial plots during the present year there are one hundred and thirty-three names. In a few instances the same variety is entered twice or three times as these have been imported from the countries widely separated. When such is the case the names have been used in the lists in the same way as if they were separate varieties, but by referring to the College Report for 1892, the countries can there be found where each lot of oats was obtained from.

Yield of 133 Varieties of Oats.

Varieties.	Color of grain.	Results for 1893.			Average results for number of years grown on plots.		
		Weight per measured bushel.	Straw per acre.	Grain per acre.	Weight per measured bushel.	Straw per acre.	Grain per acre.
Grown for five years:		lb	tons.	bush.	lb.	tons.	bush.
1 Joanette Black	Black..	36.5	2.5	88.2	36.0	2.7	84.0
2 Chenailles Black	"	34.1	3.5	91.1	35.4	2.9	81.5
3 Black Etampes	"	34.5	2.8	84.8	35.9	2.6	80.2
4 Siberian (Russia)	White.	32.3	2.9	74.5	35.6	2.6	76.7
5 Improved Besthorn	Yellow	30.8	2.5	76.6	32.8	2.1	77.1
6 Danebrog	White..	29.8	2.6	73.5	32.7	2.4	75.0
7 Pringle's Progress	"	30.9	2.4	78.2	30.3	2.3	75.0
8 Houdan Black	Black..	34.0	2.8	65.4	35.8	2.2	74.8
9 Oderbrucker	White..	35.6	2.3	72.9	31.6	2.5	74.7
10 Probsteier	"	30.9	2.5	74.2	32.5	2.5	74.4
11 White Canadian	"	31.5	3.2	76.7	33.6	2.8	73.6
12 Poland White	"	33.8	2.7	66.4	37.5	2.4	72.6
13 Waterloo	"	28.0	2.8	66.0	30.8	2.6	72.4
14 Bavarian	"	29.0	3.0	71.6	30.8	2.7	71.0
15 Yellow Gigantic	Yellow	27.0	3.0	68.3	28.8	2.7	68.7
16 Georgian	White.	30.6	2.9	54.6	32.6	2.7	68.0
17 Egyptian	"	29.4	3.0	58.7	34.7	2.8	68.0
18 Siberian (France)	"	38.1	3.1	51.7	38.3	2.3	66.3
19 Acclimatized Black Tartarian	Black..	24.0	3.0	52.6	28.4	2.6	65.1
20 Black Poland	"	25.3	3.0	58.0	29.4	2.9	65.2
21 Black Champion	"	24.3	3.1	64.1	28.9	2.5	65.0
22 Black Tartarian	"	28.0	3.3	65.2	32.0	2.8	64.3
23 Rosedale	White..	26.5	3.2	64.7	33.3	3.0	63.7
24 Victoria White	"	34.1	3.7	61.6	39.1	2.7	63.5
25 White Abundance	"	29.8	3.2	65.2	31.9	2.6	63.1
26 Improved Waterloo White	"	26.8	3.1	55.6	31.2	2.2	62.6
27 Black Hungarian	Black..	24.3	2.9	52.1	29.2	2.8	62.5
28 Nubian Black	"	24.8	2.9	52.9	30.2	2.7	62.1
29 California White	White..	32.0	3.1	55.3	33.7	2.8	62.3
30 Flying Scotchman	"	32.5	3.0	53.9	36.6	2.4	62.2
31 American Welcome	"	34.1	3.3	67.9	39.2	2.5	61.3
32 Cluster or Triumph	"	32.3	3.6	58.1	37.6	2.5	61.0
33 Hopetown (Ontario)	"	28.8	3.2	60.9	33.0	2.5	60.2
34 August White	"	38.7	3.1	54.7	38.7	2.9	59.5
35 Pedigreed Black Tartarian	Black..	26.6	2.6	59.0	33.1	2.3	59.0
36 Early Blossom	White..	34.1	3.1	51.9	38.5	2.4	58.9
37 Black Tartarian	Black..	26.3	2.7	54.4	31.0	2.1	58.2
38 Flanders White	White..	30.5		76.3	28.1		58.1
39 Prolific Black	Black..	28.5	3.1	75.7	30.3	2.5	57.9
40 Dutch Bren	White..	33.5	3.3	52.4	37.5	2.4	57.4
41 Yellow August	Yellow	25.8	3.1	25.1	24.9	3.0	57.4
42 White (Australia)	White..	33.4	2.6	55.1	38.5	2.2	57.3
43 Podelisher	"	34.1	2.8	46.0	38.8	2.6	57.1
44 Victoria Prize White	"	35.5	2.8	43.3	38.3	2.2	56.5
45 Carter's Prize Cluster	"	32.1	3.4	49.8	38.6	2.4	56.4
46 Black Red Crown	Black..	25.8	2.8	39.0	31.0	2.4	56.3
47 White Tartarian	White..	26.3	3.3	44.0	31.2	3.2	56.1
48 Thurigen	Yellow	28.1	3.3	65.9	29.8	2.9	56.0
49 White Poland	White..	34.0	3.1	55.0	34.0	2.7	55.8
50 White Hungarian	"	31.2	2.7	52.1	33.3	2.6	55.8
51 Welcome	"	36.1	2.9	46.1	38.1	2.3	55.1
52 Rennie's Prize White	"	32.5	3.4	51.7	37.3	2.5	54.5
53 Racehorse	"	36.4	2.8	55.9	37.6	2.3	54.1
54 Yellow Flanders	Yellow	28.0	3.9	64.6	30.3	2.9	54.0
55 Colommiers	Black..	25.0	2.8	34.1	30.7	3.0	53.0
56 Potato	White..	25.6	2.8	21.6	34.2	2.5	53.0
57 Port Adelaide	"	32.3	3.2	57.7	37.7	2.5	52.4
58 Early Racehorse	"	31.5	3.3	57.8	38.0	2.2	52.1
59 Potato	"	34.8	2.8	57.8	33.7	2.6	51.6
60 Round or Branching Black	Black..	27.0	3.5	40.3	30.3	2.7	51.0
61 Longfellow	White..	30.8	3.4	44.6	34.2	2.8	50.5
62 Australian White	"	37.8	2.5	65.1	38.2	2.3	50.5

YIELD OF 133 VARIETIES OF OATS.—*Continued.*

Varieties.	Color of grain.	Results for 1893.			Average results for number of years grown on plots.		
		Weight per measured bushel.	Straw per acre.	Grain per acre.	Weight per measured bushel.	Straw per acre.	Grain per acre.
Grown for five years:		lb.	tons.	bush.	lb.	tons.	bush.
63 Brie Black	Black	25.0	2.7	26.6	30.1	2.9	**50.2**
64 Angus	White..	32.1	2.9	53.3	34.4	2.6	**50.0**
65 Bertram's Prolific	"	23.8	3.2	38.3	32.5	3.0	**49.7**
66 Triumph	"	30.0	3.1	50.5	31.5	2.5	**48.8**
67 Dun	Dun...	29.0	3.6	28.0	31.6	2.7	**48.5**
68 Providence	White..	26.0	3.0	23.3	32.1	2.8	**47.8**
69 Hamilton	"	30.3	3.0	32.3	33.5	2.8	**47.7**
70 Hungarian Black	Black..	29.3	2.6	64.6	29.4	2.1	**47.6**
71 Longfellow	White..	26.8	3.3	35.8	26.8	2.9	**47.3**
72 Birkie	"	32.0	2.8	35.6	35.0	2.6	**45.4**
73 Scotch Potato	"	26.0	2.7	22.3	31.9	2.5	**44.4**
74 Dun	Dun...	25.5	2.3	23.4	30.8	3.1	**44.2**
75 Improved Scotch	White..	32.0	2.4	34.4	33.1	2.6	**44.1**
76 Hopetown (Germany)	"	31.5	2.4	39.4	31.4	2.7	**43.2**
77 Hopetown (Scotland)	"	32.0	2.3	37.3	31.9	2.9	**40.4**
78 Selected Winter	Dun...	29.8	2.5	47.7	32.0	2.3	**39.0**
79 Red Spot	"	21.0	3.8	17.5	25.8	2.8	**33.9**
Grown for three years:							
80 White Schonen	White..	30.0	2.4	79.1	32.0	2.2	**82.2**
81 Magnet	"	27.1	2.9	68.7	30.8	2.4	**80.5**
82 Golden Giant	"	25.9	2.4	62.6	27.7	2.3	**80.2**
83 Vick's American Banner	"	27.3	2.5	67.6	31.0	2.2	**80.1**
84 Wide-awake	"	29.3	2.7	72.8	33.1	2.2	**78.7**
85 White Mane	"	28.6	2.8	65.5	31.5	2.5	**78.0**
86 Holstein Prolific	"	26.8	2.4	54.1	31.6	2.1	**75.4**
87 Danish	"	27.3	2.6	61.2	23.3	2.3	**74.9**
88 Giant Swedish	Yellow	24.3	3.1	60.3	28.0	2.4	**74.4**
89 Early Calder	White..	29.1	2.9	65.0	32.0	2.4	**73.3**
90 Giant Yellow	Yellow	29.5	2.2	49.0	32.9	2.1	**67.7**
91 Early Gothland	White..	28.6	3.1	52.9	34.4	2.4	**67.0**
92 White Belgian	"	32.1	3.0	55.1	35.3	2.5	**65.0**
93 White Swiss	"	28.1	3.0	49.0	33.6	2.4	**64.7**
94 Black Mane	Black..	22.3	3.3	47.0	27.7	2.6	**63.7**
95 Clydesdale	White..	29.8	4.0	54.1	35.3	2.9	**63.6**
96 Steele's New White Cave	"	26.6	2.9	48.1	34.3	2.2	**61.6**
97 Japan	"	31.1	4.2	50.5	36.6	2.7	**61.4**
98 Early Archangel	"	35.8	2.7	44.2	28.0	2.4	**61.0**
99 New Rosedale White	"	28.8	2.5	45.2	34.2	2.2	**59.6**
100 Carter's Early Black	Black..	22.9	2.7	48.1	27.7	.....	**59.6**
101 Dakota	White..	31.8	2.6	48.2	37.5	2.8	**58.3**
102 Canadian Triumph	"	33.5	3.1	45.8	38.2	2.2	**57.8**
103 Carter's Royal Cluster	"	35.4	3.0	53.2	36.6	2.4	**56.3**
104 Victoria Prize White	"	34.5	2.4	40.8	38.5	2.1	**54.1**
105 Black Glen Rothen	Black..	25.0	3.6	22.1	30.3	2.9	**54.0**
106 Rennie's Prize White	White..	32.6	2.5	40.5	37.7	2.0	**52.6**
Grown for two years:							
107 Joanette (new French seed)	Black..	33.5	2.8	70.2	34.2	2.7	**72.5**
108 Baltic White	White..	32.4	2.5	65.6	31.6	2.5	**68.2**
109 Abyssinian	"	32.0	3.0	60.4	34.3	3.0	**67.4**
110 American Beauty	"	32.8	2.7	51.9	33.8	2.8	**64.3**
111 Wilson's White Prolific	"	28.8	1.7	58.0	27.9	2.2	**58.7**
112 Thousand Fold	"	31.0	2.4	47.2	32.2	2.5	**56.3**
113 Badger Queen	"	36.1	3.0	53.6	35.0	3.0	**53.0**
114 New Wonderful	"	34.3	2.5	45.5	34.3	2.5	**49.7**

YIELD OF 133 VARIETIES OF OATS.—*Continued.*

Varieties.	Color of grain.	Results for 1893.			Average results for number of years grown on plots.		
		Weight per measured bushel.	Straw per acre.	Grain per acre.	Weight per measured bushel.	Straw per acre.	Grain per acre.
Grown for one year:		lb.	tons.	bush.	lb.	tons.	bush.
115 Lincoln	"	31.9	2.5	69.0	31.9	2.5	**69.0**
116 Black Beauty	Black.	31.3	2.5	67.7	31.3	2.5	**67.7**
117 High Bred	"	33.8	2.1	64.5	33.8	2.1	**64.5**
118 Green Mountain	White.	29.0	1.9	64.4	29.0	1.9	**64.4**
119 New Zealand	"	26.5	2.3	63.9	26.5	2.3	**63.9**
120 Pringle's No. 6	Dun	31.5	2.1	62.2	31.5	2.1	**62.2**
121 Improved American	White.	29.9	2.1	60.9	29.9	2.1	**60.9**
122 Golden Giant	Yellow	28.8	2.1	58.1	28.8	2.1	**58.1**
123 New American	White.	28.4	2.1	56.3	28.4	2.1	**56.3**
124 Challenge	"	34.8	2.7	53.9	34.8	2.7	**53.9**
125 Jarman's Black Defiance	Black.	27.9	1.8	53.7	27.9	1.8	**53.7**
126 Rust Proof	White.	29.6	2.3	52.5	29.6	2.3	**52.5**
127 South Carolina Black	Black.	32.0	3.2	52.4	32.0	3.2	**52.4**
128 Excelsior	White.	29.3	2.0	47.7	29.3	2.0	**47.7**
129 White Dutch	"	34.3	2.3	45.1	34.3	2.3	**45.1**
130 Royal Prize Cluster	"	33.5	2.1	42.0	33.5	2.1	**42.0**
131 Texas Rust Proof	Dun	30.6	2.3	39.8	30.6	2.3	**39.8**
132 Jarman's White Monarch.	White.	32.4	1.9	38.0	32.4	1.9	**38.0**
133 North Star	"	33.3	2.0	28.5	33.3	2.0	**28.5**

Of the 133 varieties tested in 1893, 79 have been grown upon the experimental plots for five years; 27 for three years; 8 for two years; and 19 were tested during the present season for the first time. The grain was all sown broadcast at the rate of seventy-five pounds to the acre. The plots were all exactly the same size, each being 1-100 of an acre. Equal amounts by weight were sown on the plots. The land was very similar to that used for the barley, peas and spring wheat tests, but was higher in situation than that for the barley and peas, and lower than that used for the spring wheat. The seeding took place in May.

The oat crop on the plots in 1893 was scarcely up to the average of the past five years, except in amount of straw, which was somewhat in advance of former years. The average yield of grain per acre in 1893 was 54.3 bushels, and during the past five years the average was 59.9 bushels per acre. The quality of the grain was also inferior during the past season, as the weight per measured bushel showed a decrease of 2.5 lbs. when compared with the average since 1889. The very hot weather which occurred just as the oats were approaching maturity caused them to ripen very rapidly, and may partly account for the light weights during the past year.

The Experimental department has met with excellent success in introducing new and promising varieties of oats, and some most excellent kinds have been imported. Of the one hundred and thirty-three varieties now in the tests, ninety-five are foreign, and thirty-eight were obtained in Ontario. In the comparative test for five years, with seventy-nine varieties some very interesting results have been obtained. All the best yielding varieties are of foreign origin, and were imported by the Farm in the spring of 1889. The variety known as the Egyptian, which is well-known in nearly all parts of Ontario, where it has been grown for several years, was surpassed in point of yield by no less than sixteen varieties, and the well known Australian white oat was surpassed by fifty varieties. The fourteen varieties of oats at the head of the list in point of yield for five years all possess the open or spreading head, and the three kinds at the head of the same list possess grain of a black color.

Joanette. The Joanette is a black variety of oats, which was imported from France by this Farm in 1889. It heads the list in yield of grain per acre among seventy-nine varieties which have been grown on the plots during the past five years. The average amount of grain per acre during that time was 84 bushels, and in 1893 the yield was 4.2 bushels in excess of this average. In weight per measured bushel it has been quite uniform throughout, the average being 36 lbs., and the weight in 1893 36.5 lb. This is certainly a good showing, and where the land is suitable for this variety, it is certainly one of the most productive kinds that can be found. It is exceedingly short in the straw, as the average height for three years has only been 40.7, and fully one half of the varieties grown gave an average height of over 50 inches. It has a spreading head of good size. The grain has an exceedingly thin hull, and in fact in an examination made of the grain of all the varieties grown, none had a less percentage of hull than the Joanette. The straw usually stands up well, and is much less susceptible to rust than most other varieties. It takes on an average 104 days from seeding time until it reaches maturity.

The Chenailles Black and the Black Etampes varieties were imported from France at the same time as the Joanette. These three varieties are very similar in all characteristics, and may be considered as the same kind. One very interesting feature is the record that each one has made. All three are as near the head of the list as they can get, when the varieties are arranged according to yield of grain per acre. Among one hundred and thirty-three varieties grown in 1893, these three French oats were unsurpassed by any of the other kinds, which certainly speaks well for each of them. They require good strong land, which is apt to grow a large quantity of straw. It is useless to endeavor to grow these French oats on poor land, as the straw is naturally quite short. The Joanette oat is now introduced in nearly every county of Ontario, and where land is suitable it is making a good record for itself.

Siberian. This is an oat which seems well adapted for nearly all kinds of soil. It was imported by this station from Russia five years ago, and has given a much larger yield of grain per acre than any Ontario variety which has been grown on this Farm. Not only has it surpassed all the other varieties of white oats in the comparative tests on the station plots, but in average yield of six varieties of oats sent out over Ontario and tested in 125 different localities, the Siberian took the lead. The average yield per acre of this variety, in these co-operative tests in 1892, was 58.8 bushels, and in the station test for five years, the average yield per acre has been 76.7 bushels. The average weight per measured bushel for five years has been 35.6 lb. It is about the same length of time in reaching maturity as the Joanette, and possesses a straw which grows about ten inches longer. The Siberian is also quite free from rust as compared with many other varieties, and it is usually quite strong in the straw. The head is spreading in nature, and is about nine inches in length, which is about two inches longer than that of the Joanette. There are nearly fifty grains in the average head, and the grains are of good length. The Siberian has also taken the lead of all the white oats grown in large plots at this station.

Improved Besthorn. The Improved Besthorn was imported from Germany, and has taken second place in point of yield per acre of grain among all the light colored varieties of oats grown on the plots for the past five years. The grain of this variety is yellow in color. It is about three days later in reaching maturity than either the Joanette or the Siberian. It grows to almost exactly the same height as the Siberian, but is slightly more affected by rust, and the straw is usually more apt to lodge. It also has a spreading head, which measures about 8 inches in length. About fifty grains is the average number per head. For five years the average weight per measured bushel has been 32.8 lbs., and the average yield per acre for the same length of time is recorded to be 75.1 bushels.

Donebrog. This is another German variety, which has done well on the plots. In many characteristics it resembles the Improved Besthorn, but the grain, instead of being yellow, is white. It, however, possesses better straw than the above-mentioned variety, both as regards strength and freedom from rust. The average yield for five years on the plots has been 75 bushels per acre.

White Schonen. The seed of this variety was obtained in Ontario three years ago, and, among twenty-seven varieties grown for three years, the White Schonen has given the largest average yield of grain per acre. For that time the average yield has been 82.2 bushels per acre, and the average weight per measured bushel 32 lb. It is a white oat with a spreading head ; 106 days is the average time taken from seeding until the grain is ready to harvest. Straw grows vigorously and reaches a length of about 50 inches.

Lincoln. Nineteen new varieties of oats were tested on the plots in 1893 for the first time. These varied in yield from 28.5 bushels to 69 bushels of grain per acre. The largest amount of grain was produced by the Lincoln oat, the seed of which was obtained from the United States This variety had been extensively advertised by the American seedsmen, and so far it has shown itself worthy of much praise. It is an entirely new variety. From seed time till harvest required a period of 94 days. It is a strong grower, the straw reaching a length of 51.5 inches. The weight per measured bushel, however, was only 31.9 lb. during the year 1893.

Beans, Comparative Test of 17 Varieties.

In 1893, 17 varieties of beans were grown on plots side by side. The land contained barley in 1892, and was manured in the spring of 1890. Each plot was one one-hundred and-sixtieth of an acre. The beans were planted in rows 25 inches apart on May 22nd, and were cultivated throughout the season. After reaching maturity they were harvested in the ordinary way, and when dry were thrashed.

Varieties.	Yield per acre.	Varieties.	Yield per acre.
	Bushels.		Bushels.
1. California Pea	28.8	10. Yosemite Mammoth Dwarf Wax	7.2
2. Prolific Dwarf Tree	27.3	11. Marrowfat	5.9
3. Small White Field	24.6	12. Horse (Montreal)	1.7
4. Boston Pea	22.3	13. Heligoland (England)	1.5
5. Yellow Soy	20.4	14. Broad Windsor	0.67
6. Medium or Navy	17.7	15. Selected White Eye	0.61
7. Yellow Eyes, or Boston Favorite	17.3	16. Common Tick	0.35
8. Giant Dwarf Wax	15.8	17. Common Horse	0.24
9. Edamaine	7.6		

The seed of the first four varieties was obtained from Ontario, and that of the Yellow Soy from the United States. It will be noticed that the Horse Beans did very poorly indeed. The stems and leaves turned black before it was time for the beans to ripen, and the production grown was exceedingly small. The seed of 5 varieties of fodder plants was obtained as a gift from the Kansas Experimental Station. Some of these grew luxuriantly, and were they somewhat earlier they would certainly be of great promise. Two of the varieties out of the five reached a sufficient stage of maturity to produce a crop of beans, and are included in this list of numbers, 5 and 9. The other varieties which did not mature their seed were Yamagata, Cha Daidzie, Kiyusuke Daidzie and Black Podded Adyuski. These varieties will, however, be tested another year.

Buckwheat, Comparative Test of Three Varieties.

The buckwheat was sown upon clay loam, which contained barley in 1892 and roots the year previously. The plots were each one one-hundred-and-sixtieth of an acre in

size. The grain was sown broadcast on May 12th. The crop of each variety stood up well and gave a good appearance until harvested.

Varieties	Yield of Straw per acre (tons).	Yield of Grain per acre (bushels).
1. Japanese	5.11	20.30
2. Silver Hull	3.17	13.03
3. Common Grey	3.25	12.93

It will be observed that the Japanese variety gave nearly double the yield of grain per acre of the Common Grey variety. It also gave about two-thirds as much again straw as this variety. It stands up remarkably well and makes a good growth throughout the season. The grain is very large in size.

Grains Sown in Mixtures.

Barley, peas, spring wheat and oats were sown singly and in various combinations in the spring of 1893. No less than eleven different mixtures of two, three or four kinds of grain were used for this experiment. A similar experiment was conducted in 1891 with a less number of mixtures, and in all probability this line of tests will be continued in the future. The single grains and the various mixtures were all sown on duplicate plots. Each plot was exactly one one-hundreth of an acre in size. The grain was sown broadcast. The grains, when used separately, were sown with the same quantity of seed per plot as was used in the variety tests; but when used in combinations, they were sown as follows: In one set two-thirds the quantity of seed that was used in the separate sowings was used in every instance, and in the second set, when two grains were sown together, one-half the amount of seed of each in the separate sowings was used; when three grains were used, one-third the amount of seed used in the separate sowings, and when four grains were used, one-fourth the amount of seed was sown. The land was a clay loam, and quite elevated. No manure had been applied for three years previous to 1893. The results of the experiment has been reckoned as follows: In the first place, the crops from the two sets of plots were added, and then the crops from the plots of single grains were averaged to correspond with the grains used in the mixture under consideration. From the results thus obtained, the yields per acre were estimated.

Mixtures.	Yield of Straw per acre.		Yield of Grains per acre.	
	Sown Separately.	Sown in Mixture.	Sown Separately.	Sown in Mixture.
	tons.	tons	lb.	lb.
Barley and peas	1.18	1.61	1058	1055
Peas and wheat	1.25	1.46	965	744
Wheat and oats	1.77	1.82	1428	1747
Barley and oats	1.70	2.05	1521	2216
Wheat and Barley	1.17	1.26	763	638
Peas and oats	1.64	2.16	1698	1925
Barley, peas and wheat	1.24	1.76	936	1070
Peas, wheat and oats	1.55	2.20	1361	1655
Barley, wheat and oats	1.73	2.19	1310	2122
Barley, peas and oats	1.50	2.07	1425	2043
Barley, peas wheat and oats	1.47	2.11	1243	1885

The results show that in eight cases out of eleven the mixed crop gave a larger yield of grain per acre than the same crops when grown separately. In regard to straw, the mixtures gave the largest yield in every instance. The greatest yield of grain per acre was from barley and oats sown in combination; the second highest yield of grain was from barley, oats and wheat sown together; and the third highest yield was from barley, oats and peas sown as a mixture. Peas, wheat and oats sown together gave the greatest weight of straw per acre, and the average of the wheat and barley grown separately the least weight of straw per acre. These results are worthy careful study, and it might be mentioned that the results of 1891 were quite similar to those of 1893, the mixed grains producing the greatest yield in every instance.

Selection of Grain for Seed.

A very important feature of experiment station work should be along the line of investigation regarding the relative value of sowing good *versus* poor seed. It seems to be the practice of some people to sell all their choice grain, and then sow the grain which would not bring the top price in the market. The seed might be all true to name and perfectly pure, but of a poorer quality. Is it not true that too often the screenings from grain taken to market is again cleaned and the best of the screenings sown for the purpose of producing the next crop. It is the present intention of this Farm to enter quite extensively upon investigations relating to the quality of seed which should be sown. It is our rule invariably to hand-pick all seed sown on the plots for comparison of varieties, and also all seed distributed to farmers for testing. This is done after the grain has first been well cleaned. About 5,000 packages of seed grain were very carefully cleaned and hand-picked in the winter of 1892-3.

A few experiments were carried on in the summer of the present year, in selecting seed of barley, peas, spring wheat and oats. The grain was sown broadcast, and at the same rate per acre, by weight, as was used of the grains when sown in the variety tests. Each plot was 1-160 of an acre in size. The land had not received any manure since the spring of 1890, at which time a dressing of fifteen tons per acre was applied. Owing to an exceedingly late spring and several hundred plots of grain to be sown, the seeding did not take place until May. This lateness of seeding no doubt accounts for some of the yields being low. The yields per acre are estimated from the actual yields of the plots.

Yields of barley from different qualities of seed:

Quality of grain.	Yield of straw per acre.	Weight per measured bushel.	Yield of grain per acre.		
			1892.	1893.	Average 2 years, 1892-93.
	tons.	lb.	bush.	bush.	bush.
Large grains	.59	42.3	27 0	7.2	17.1
Small grains	.52	40.8	18.1	6.8	12.5

It will be observed that in the case of barley a certain quantity of large grains gave a better return in every particular than was produced by the same quantity by weight of small grains. The better sample of seed produced 37 per cent. more grain than the poorer lot. In weight per measured bushel in 1893 the large grain had the advantage by 1.5 lb.

Yields of peas from different qualities of seed :

Quality of grain.	Yield of Straw per Acre.	Weight per measured bushel.	Yield of grain per acre.		
			1892.	1893.	Average 2 years, 1892-93.
	tons.	lb.	bush.	bush.	bush.
Large whole peas	1.01	63	25.9	19.8	22.9
Small whole peas	.99	62½	....	17.8	....
Peas cracked in two by machine	.27	....	12.2	4.4	8.3

The results of the experiment in selecting peas shows that the large whole peas gave the best returns both in 1892 and in 1893. There was an average of nearly three times as much grain from whole peas as from the cracked seed. The difference between the yield from the large as compared with the small peas is not very great, but two bushels per acre with a large crop of peas would make a total of a good many bushels, and consequently a good many dollars and cents. It might be mentioned that the small peas were plump and smooth, simply lacking in size.

Yields of spring wheat from different qualities of seed :

Quality of grain.	Yield of straw per acre.	Weight per measured bushel.	Yield of grain per acre.
	tons.	lb.	bush.
Large plump grain	.77	56.8	7.8
Small plump grain	.57	56.7	5.9
Shrunken grain	.60	55.5	5.3

The shrunken seed gave a yield of 2.5 bushels per acre less than the large plump seed and also produced a grain much inferior in quality. The Herison bearded variety was used in this test. The results of the experiment point in favor of sowing the best quality of seed.

Yields of black oats from different qualities of seed :

Quality of grain.	Yield of straw per acre.	Weight per measured bushel.	Yield of grain per acre.
	tons.	lb.	bush.
Pure black oats	1.96	32.3	45.7
Very pale black oats	1.82	30.3	38.8
Oats without hulls	1.44	33.8	34.4

The variety of oats used in this experiment was the Joanette, and much care was exercised in the selection of the seed. The oats mentioned in the third place were all hulled by the machine and selected out from among others. Many of the Joanette oats are very apt to lose their hulls in the threshing, owing to the thinness of the hulls. The results show that there is a yield of over eleven bushels per acre more from the oats with the hull on as against those with the hull off. The weight per measured bushel, however, is greater with the hulless, although in the crop produced no difference could be found in regard to the percentage of hulled oats of the different seed used. The light oats gave both a less yield per acre of grain and a lighter weight per measured bushel than the black plump seed of the same variety.

Grains Grown on Large Plots.

Some of the varieties which have given the best results for two, three or four years have been grown on large plots in both the Experimental and Farm departments. The object of the large plots in the Experimental department is to supply seed for free distribution over Ontario in connection with the Agricultural Experimental Union, and also to supply seed of the choice varieties to the Farm department of this institution. The seed of all the grain crops grown in the Farm department of the College during 1893 was supplied either directly or indirectly from the Experimental department. About ninety acres of grain were grown in the large fields in sections of from one to ten acres of the various varieties. There is no variety of grain now grown at this institution which was not first grown upon our small sized plots of one one-hundredth of an acre, and from this gradually increased as the value of the variety would justify us in so doing.

POTATOES AND ROOTS.

During 1893, 157 varieties of potatoes and 184 of roots were grown on the experimental plots. Besides the variety tests there were 118 plots devoted to experiments in methods of cultivation of both potatoes and roots. The land upon which these were grown might be termed an average clay loam, upon which manure was applied at the rate of 15 tons per acre in the spring of the present year. Rape was grown on the land in 1892, and was pastured off by lambs. The soil was fairly uniform throughout, and the plots for the variety tests were each exactly one one-hundredth of an acre in size. The plots used in the experiments in regard to the methods of cultivation varied in size according to circumstances, as may be noticed in speaking more especially of the detailed results.

Potatoes, Comparative Tests of 157 Varieties.

No less than 157 varieties of potatoes were grown on the trial plots during the past year. These varieties were originally obtained by us from Nova Scotia, Prince Edward Island, Ontario and the United States. Of the above number, 25 were grown this year upon the plots for the fourth time, 16 for the third time, 67 for the second time and 49 were grown at this station in 1893 for the first time. Fifteen pounds of each variety were used. This quantity was divided into 198 pieces in every instance. These were planted in three rows, each four rods long. The rows were $3\frac{1}{3}$ links apart and the potatoes were planted one foot apart in the rows. The land was drilled with a double mould-board plow. After the potatoes were planted the ridges were levelled, thus leaving the potatoes from three to four inches below the surface. Planting took place on the 23rd and 24th of May, except Nebula, Seneca Beauty, Pride of Ireland, Bill Nye, Six Weeks, Woodbury White, Howe's Premium, and Pearl of Savoy, which were planted on June 3rd, and Early Harvest and Rochester Rose, which were planted on June 13th. Flat cultivation was used throughout, and the application of the Paris green solution was used three times to destroy the potato beetles. The crop was removed from the ground with a potato digger.

YIELDS OF 157 VARIETIES OF POTATOES.

Varieties.	Results for 1893.			Average yield per acre for number of years grown on plots.
	Percentage of crop marketable.	Weight of 30 best developed potatoes.	Yield per acre.	
Grown for four years:		lb.	bush.	bush.
1 Empire State	94.9	12.8	226.7	**183.1**
2 Summit	90.0	10.8	188.3	**167.5**
3 Thorburn	94.0	11.0	167 5	**152.9**
4 London	89.1	11.0	183.3	**149.3**
5 Clarke's No. 1	89.5	11 0	182.1	**146.3**
6 Early Mane	85.8	9.8	182.5	**144.3**
7 Sweet St. Vernal	91.8	9.0	163.0	**133.7**
8 Rural New Yorker, No. 2	94.6	10.8	153 3	**130.5**
9 Pootaluck	87 8	10.8	177.1	**129 4**
10 Early Puritan	90.9	9.8	174.6	**129.0**
11 Daisy	91.2	9.8	190.0	**128.9**
12 Late Rose	91.2	9.8	146 6	**127.1**
13 Early Sunrise	88.3	10.8	210.4	**126.3**
14 Beauty of Hebron	93.1	10.8	182.5	**119.9**
15 Minister	92.8	7.8	104 2	**111.8**
16 Rural Blush	83.2	8.0	114.1	**109.7**
17 Green Mountain	91.6	9.3	143.7	**108.6**
18 Hatton's Seedling	81.4	8.8	157.1	**104.1**
19 Rose's New Invincible	88.6	8.8	142.8	**103.7**
20 White Elephant	87.7	8.8	129.2	**102.4**
21 Early Ohio	85.4	9.8	154.2	**100.6**
22 Crown Jewel	87.7	8.8	162.9	**100.4**
23 Dakota Red	90.4	8.0	134.6	**98 9**
24 Rosy Morn	81.3	7.3	142 5	**92.9**
25 Stray Beauty	78.8	7.0	139.6	**84.1**
Grown for three years:				
26 Tonhocks	81.6	7.0	185.8	**165 3**
27 Convoy	83.1	7.3	123.8	**142.4**
28 Early Oxford	80.3	6.0	128.7	**135.1**
29 Advance	79.0	7.3	126.7	**129.6**
30 Woodbury White	81.5	7.0	144.2	**128.5**
31 Thunderbolt	62.1	5.3	122.1	**127.2**
32 Balger State	75 3	6.0	104.6	**125.7**
33 Early Rochester	79.9	6.3	117.9	**123.8**
34 Hoffman	72.0	6.0	144.2	**123.8**
35 Early Rose	81.0	6.8	118 3	**123.6**
36 Kosh Konong	78.2	6 3	99.6	**118.5**
37 Putnam	50.7	4.3	93.0	**116.4**
38 Early Dominion	77.0	6.3	146.6	**115.6**
39 Silver King	62.1	5.0	103.3	**114.2**
40 Ohio Junior	85.4	6.8	113.8	**104.6**
41 Queen of the Valley	79.8	6.3	86.6	**88.1**
Grown for two years:				
42 King of the Roses	79.7	7.0	157.9	**159.8**
43 Molly Star	77.2	6.3	155.4	**155.0**
44 Early Everett	80 5	6.0	155.9	**154.6**
45 White Star	92.3	10 5	216.6	**153.3**
46 Burbank's Seedling	70 0	5.5	141.7	**152.9**
47 Mammoth Pearl	76 2	6.0	132.9	**152.1**
48 Early Gem	84.0	5 5	150.3	**150.2**
49 Thorburn's Extra Early	66.7	6.5	153.7	**149 4**
50 Polaris	78.2	6.5	150.8	**149.2**
51 Negro	55.6	4.5	135.0	**146.9**
52 Island McDonald	80.0	6.5	125.0	**145.8**
53 Hovel Favorite	78.4	6.8	144.6	**145.4**
54 The Dandy	70 2	6.3	138 3	**142 5**
55 New Queen	56.4	10.0	188.3	**142.1**
56 Munroe Co. Prize	73.4	6.8	103.3	**141.8**

YIELDS OF 157 VARIETIES OF POTATOES.—*Continued.*

Varieties.	Results for 1893. Percentage of crop marketable.	Weight of 30 best developed potatoes.	Yield per acre.	Average yield per acre for number of years grown on plots.
Grown for two years:		lb.	bush.	bush.
57 Watson's Seedling	79.4	6.5	137.5	**141.3**
58 Everett's Seedling	75.7	6.5	144.2	**141.3**
59 St. Patrick	84.3	7.0	140.4	**141 0**
60 Burpee's Extra Early	75.7	5.8	164.5	**140.8**
61 Red Australian	83.6	6.3	127.1	**140.6**
62 Halo of Dakota	90.6	5.8	124.1	**138.7**
63 Eureka	67.0	4.8	126.2	**135.6**
64 N. B. & G. Co's Grand Mogul	95.1	9.3	179.6	**135.2**
65 Paris Rose	66.3	5.3	138 3	**131.6**
66 Dempsey's Seedling	83.6	7.0	157.1	**133.8**
67 Chicago Market	79 8	6.0	131 7	**133.4**
68 Early Essex	86.9	8.0	177.5	**133.1**
69 Delaware	83.2	5.8	121.2	**130.4**
70 Early May Flower	83.6	6.3	152.5	**129.2**
71 Ohio Junior	88.5	8.3	180.9	**129.6**
72 State of Maine	89.4	6.8	156.7	**128.8**
73 Vick's Perfection	97.2	7.8	192.9	**128.3**
74 The Ideal	75 9	5 5	128 0	**127.3**
75 Prince Albert	58.5	4.5	98.3	**126·9**
76 Early Market	92.7	9.5	154 6	**125·6**
77 Chautauqua	83.3	5.8	99.6	**122·5**
78 Morning Star	68 8	4.8	125.4	**121·9**
79 Landreth's Garfield	79.1	6.0	153.7	**121·9**
80 Sunlit Star	68 3	5.0	110.4	**121·0**
81 P. E. I. Early Rose	82.3	6.5	103.3	**119·4**
82 Vick's Champion	84.5	6.8	123 8	**119·0**
83 Alexander's Prolific	67.6	5.3	115.8	**118·7**
84 The Rosedale	73.3	5.3	96.7	**115·4**
85 Mount Carbon	65.8	5.3	100.8	**115·0**
86 Extra Early Vermont	85.9	7.0	118.3	**115·0**
87 Landreth's Farmer's Alliance	85.7	5.8	101.6	**114·8**
88 Snowflake	55.0	4.3	113 8	**114·4**
89 Chas. Downing	50.4	3.8	111 6	**113·3**
90 Garnets	89.9	6.8	107.5	**108·1**
91 Snow Queen	56.9	4.8	99.6	**107·3**
92 Belle, A C	70.6	5 5	99.2	**106·7**
93 Boley's Northern Spy	85.8	7.5	137.9	**106·7**
94 Harbinger	39.7	3.8	94.5	**106·4**
95 Mammoth Pearl	87.6	9.0	104.8	**104.8**
96 Wilson's First Choice	84.5	5.8	134.2	**104·0**
97 Royal Adelaide	87.7	6.0	115.8	**102·8**
98 Rose Seedling	89.0	7.3	83.3	**100.6**
99 Woodbury White	89.7	8.5	165.4	**100.6**
100 Landreth's State of Maine	47.98	3.3	72.1	**96.5**
101 McIntyre	75.7	5.8	107.9	**95.6**
102 Edwards	88.6	6.0	128.0	**93.8**
103 White Lily	83.0	5.5	115.0	**92.3**
104 Lady Finger	28.3	3.5	95.9	**91.5**
105 Hopeful	79.7	6.5	98.4	**91.1**
106 May's Imperial	90.3	7.5	145.4	**85.2**
107 Pearce's Prize Winner	74.6	5.0	45.8	**67.4**
108 Vaughan	90.8	9.3	99.2	**59.0**
Grown for one year:				
109 Pearl of Savoy	95.3	11.5	195.4	**195 4**
110 North Pole	76.9	7.0	177.1	**177.1**
111 American Giant	90.3	9.0	171.6	**171.6**
112 Early Pontiac	78.1	6 3	168.4	**168.4**
113 Columbus	88 3	8.5	166.7	**166.7**
114 Nebula	82.1	6.8	165.4	**165.4**
115 Woodbury White	90.5	7.5	162.5	**162 5**

YIELDS OF 157 VARIETIES OF POTATOES.—*Continued.*

Varieties.	Results for 1893.			Average yield per acre for number of years grown on plots.
	Percentage of crop marketable.	Weight of 30 best developed potatoes.	Yield per acre.	
Grown for one year:		lb.	bush.	bush
116 Burpee's Superior	88.5	6.5	158.8	**158.8**
117 Early Six Weeks	78.1	6.5	153.7	**153.7**
118 Timpes No. 4	84.3	8.3	151.3	**151.3**
119 Early June Eating	82.5	7.5	145.0	**145.0**
120 Seneca Beauty	97.4	15.8	144.6	**144.6**
121 Rochester Rose	90.8	7.8	144.6	**144.6**
122 Van Ooman's Earliest	79.0	6.0	142.5	**142.5**
123 Granger	83.4	6.8	140.4	**140.4**
124 Bruce's White Beauty	78.5	6.5	137.5	**137.5**
125 Steele's Earliest of All	82.6	6.5	136.3	**136.3**
126 Bill Nye	89.8	7.0	131.2	**131.2**
127 The Freeman	78.1	6.3	131.1	**131.1**
128 Early Yorker	83.3	7.5	130.4	**130.4**
129 Browell's Seedling	90.9	8.0	128.0	**128.0**
130 Alexander's Prolific	93.7	6.0	126.3	**126.3**
131 Early Harvest	87.0	6.5	125.4	**125.4**
132 Golden Harvest	77.7	6.3	125.0	**125.0**
133 Improved Rose	83.3	5.5	124.5	**124.5**
134 Six Weeks	88.2	9.5	123.3	**123.3**
135 Early Norther	92.9	8.3	122.5	**122.5**
136 Potentate	78.9	6.5	114.6	**114.6**
137 Arizona	79.1	8.3	111.6	**111.6**
138 Keiser	89.9	7.0	111.6	**111.6**
139 Scotch Regent	68.2	4.0	107.5	**107.5**
140 Beauty of Beauties	78.5	6.0	104.6	**104.6**
141 Pride of Ireland	85.2	8.8	104.2	**104.2**
142 Howe's Premium	87.5	6.3	100.0	**100.0**
143 Parson's Prolific	82.1	7.5	97.9	**97.9**
144 Vick's American Wonder	87.5	6.8	96.7	**96.7**
145 World's Fair	76.7	6.0	96.7	**96.7**
146 Ontario	78.1	6.0	89.6	**89.6**
147 American Wonder	83.5	7.3	88.3	**88.3**
148 Great West	71.3	6.0	87.1	**87.1**
149 Eyeless	54.8	4.5	70.0	**70.0**
150 The People's	82.5	6.8	66.6	**66.6**
151 Montana Wonder	59.6	4.8	62.9	**62.9**
152 Reed's Eighty Six	76.5	6.0	33.8	**33.8**
153 Columbian Peach Blow	51.9	3.0	33.8	**33.8**
154 New Satisfaction	42.7	3.3	31.3	**31.3**
155 General Gordon	94.3	5.0	29.2	**29.2**
156 Maggie Murphy	90.6	6.0	26.7	**26.7**
157 Manitoba Rose	80.0	5.0	25.0	**25.0**

It will be observed that the yield of potatoes for 1893 was light, but the quality throughout was good. There was no rot among any of the varieties, and but very little of the scab made its appearance. The summer was too dry for the growth of the potatoes in the manner to give large yields.

The Empire State, which stands at the head of the list in yield of potatoes per acre among 25 varieties grown on the plots for four years, also stands at the head of the list in yield per acre among the 157 varieties grown during 1893. This variety has not only done exceptionally well on the trial plots on this Farm, but it has made an excellent record for itself in the co-operative experiments carried on over Ontario. In the year 1891, among six varieties grown in eleven different localities over Ontario, it stood second in point of yield, and in 1892 it gave the highest yield per acre among six varieties grown in 121 sections over the province. It is a potato of good quality and requires about 110 days from planting until it reaches maturity.

The Summit variety, which comes second in the list in regard to average yield per acre for four years, also stands high in yield for the past year. It is also a variety which has made an excellent record for itself over the province in the co-operative experiments. In the co-operative tests above mentioned, it came first in point of yield among the varieties used in 1892. It is about one week earlier in reaching maturity than the Empire State. These two varieties have certainly made an excellent showing, and, in our experience, we consider them the two leading varieties of all those which have been tested at this station during the past four years.

The following varieties produced the smallest percentage of little potatoes among the 157 tested during the past year, namely: Seneca Beauty, Vick's Perfection, Pearl of Savoy, N. B. & G. Co.'s Grand Mogul, Empire State, Rural New Yorker and Thorburn. Among the different varieties, the Empire State, Pearl of Savoy, Thorburn, London and Clark's No. 1 varieties were found some of the largest potatoes grown in 1893. The Tonhocks heads the list in yield per acre among the 16 varieties grown for three years; the King of the Roses heads the list among the 67 varieties for two years, and the Pearl of Savoy heads the list among the 49 varieties which were grown on the experimental plots in 1893 for the first time.

Potatoes, Different Depths of Planting Seed Tubers.

An experiment has been conducted during each of the past three years in planting potatoes at 1, 3, 5 and 7 inches below the level. The test each year was carried on in duplicate. Nature of soil and previous cultivation were the same as with the variety experiments. Planting took place on May 25th. The rows were 3⅓ links apart and the potatoes were planted one foot apart in the row.

Comparative Yields of Potatoes from Different Depths of Planting.

Depth of Planting.	Average yield per acre from duplicate tests.			Average yield per acre for three years. (6 separate tests).
	1891.	1892.	1893.	
	bush.	bush.	bush.	bush.
1 inch	160.7	147.1	117.0	**141.6**
3 inches	188.4	152.1	127.7	**156.1**
5 inches	224.2	153.8	123 0	**167.0**
7 inches	256.1	158 5	123.8	**179 5**

The results of this experiment show that the largest yield of potatoes per acre in 1893 was produced from planting three inches deep and the poorest yield from planting one inch deep. In 1891 and 1892 the comparative yields from the different modes of planting ran in the same order, namely: The poorest yield per acre from planting one inch deep, the next poorest from planting three inches deep, the next poorest from planting five inches deep, and the best from planting seven inches below the surface. The largest percentage of marketable potatoes came from the deepest planting and the largest potatoes were also from the deep planting. The average yield per acre for the duplicate experiments for three years shows an average increase of 37.9 bushels per acre from the deep planting as compared with the shallow planting. The results from planting potatoes at different depths are certainly very interesting, and will, in all probability, be continued for a number of years to come, until more definite conclusions may be drawn from the results.

Potatoes, Preparation of Seed Tubers.

This experiment was carried on in duplicate in 1893, and also in 1892, to ascertain the results from the preparation of seed tubers in different ways and from different modes of planting the same. In each section of the experiment ten plots were used. The quantity of seed per acre was the same as with the variety tests. The preparation of the soil, including manuring, etc., was precisely the same as used for the comparative tests of the different varieties previously mentioned. Planting in 1893 took place on May 25th. The rows were $3\frac{1}{3}$ links (26.4 inches) apart. Great care was exercised in the selection of the seed potatoes for each of the component parts of this experiment.

Yields of Potatoes from Seed Tubers Prepared Differently.

Preparation.	Yield per acre—whole crop.		Yield per acre, less seed used.		Percentage of whole crop marketable.	
	1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.
	bush.	bush.	bush.	bush.		
Large, whole, 1 foot apart	255.6	247.3	125 6	115.3	81.6	**78.4**
" " 2 feet "	210.0	185.0	135.0	113.5	88.4	**85.2**
" " 3 " "	150.1	138.6	110.1	95.6	90.9	**88.5**
Medium " 1 foot "	227.6	208.3	153.9	144.5	83.2	**83.2**
" " 2 feet "	168.8	139.4	131.3	107.2	87.7	**87.7**
Small " 1 foot "	179.5	136.3	149.5	110.3	89.6	**86.7**
Medium, cut in two, 1 foot apart.....	94.6	99.8	45.9	63.0	84.2	**83.4**
Medium, two eyes in a piece, 1 foot apart, without seed ends.....	95.2	86.1	79.0	71.0	90.4	**88.9**
Medium, one eye in a piece, 1 foot apart, without seed ends.....	50.1	44.6	40.1	36.1	93.6	**87.3**
Medium, seed ends, one foot apart	42.0	37.0	32.0	30.0	86.5	**80.2**

The largest yield per acre was obtained from planting large whole potatoes one foot apart and the next largest yield was obtained from planting medium whole potatoes one foot apart. The amount of seed used for the different plantings would of necessity vary to a large extent. After deducting the amount of seed used in each mode of planting from the total yield, it will be seen that the largest amount of potatoes still remaining was obtained from, first, medium whole potatoes one foot apart and, second, small whole potatoes one foot apart. The average, however, for two years in regard to the yield per acre is in favor of medium whole potatoes one foot apart and large whole potatoes one foot apart. The percentage of marketable potatoes from these two modes of planting is, however, comparatively low. The highest resulting from planting large whole potatoes three feet apart, from medium potatoes cut with two eyes in a piece and the pieces planted one foot apart. All things considered the best average results from the experiments of 1892 and 1893 are from planting medium whole potatoes one foot apart.

Potatoes, Application of Fertilizers.

In this experiment 13 different fertilizers were used in 1893 as in 1892. The potatoes planted on land situated about one quarter of a mile from the other potato experiments, which did not receive any manure or fertilizers for at least six years. The plots were over one-hundredth part of an acre in size. The drills were 3½ links apart and the potatoes were planted one foot apart in the drills as in the case of the other potato experiments. The seed used was covered to the depth of three or four inches. There were three rows in each plot, and one row was left unfertilized between each two plots. The planting was done May 25th and the fertilizers were sown in the drills after the seed had been dropped but before it was covered. The sodium nitrate and muriate of potash were used at the rate of 160 pounds per acre. Wood ashes unleached 800 pounds per acre, and all the other fertilizers at the rate of 325 pounds per acre.

Yields of Potatoes grown by aid of Fertilizers.

Fertilizers.	Percentage of Potatoes marketable.	Weight of 30 best developed potatoes.	Yield of potatoes per acre.		
			1892.	1893.	Average 2 years 1892-3.
		lb.	bush.	bush.	bush.
Royal Canadian	95.6	13½	208.7	113.3	**161.0**
Potato manure	96.2	12¾	178.3	109.2	**143.8**
Superphosphate (animal)	94.4	11½	159.6	104.2	**131.9**
Bone and potash	95.7	12½	154.2	96.7	**125.5**
Pure bone meal	95.0	11¼	154.6	82.5	**118.6**
Reliance	95.0	10¼	135.0	90.8	**112.9**
Superphosphate (mineral)	93.3	11	147.1	74.6	**110.9**
Sure Growth	94.4	9½	123.8	89.6	**106.7**
Nitrate of soda	94.4	9¾	127.5	82.5	**105.0**
Capelton	95.1	9½	124.6	84.6	**104.6**
Wood ashes	92.0	10⅞	122.1	84.2	**103.2**
Muriate of potash	91.7	9½	116.3	80.0	**98.2**
Victor	88.7	9¾	111.3	77.5	**94.4**
No fertilizer	86.1	9	105.0	72.1	**88.6**

It will be observed from the results of this experiment that the lowest yield of potatoes per acre was from the unfertilized plot in 1893 as well as in 1892. Also that the Royal Canadian fertilizer gave the highest yield per acre in both years. From the unfertilized plot there were only 86.1 per cent. of the potatoes marketable, while from nearly all the plots upon which fertilizer had been applied over 90 per cent. of the potatoes were in a marketable condition. The results of the fertilizers upon the yield of the potatoes in 1892 and in 1893 are certainly quite uniform throughout.

Swede Turnips, Comparative tests of 54 Varieties.

There were 54 varieties of Swede turnips grown on the plots in 1893. Of this number 30 varieties were grown for three years, 8 varieties for two years, and the remaining 16 kinds were grown during the past year for the first time on this Farm. The seed of the different varieties was obtained from the United States, England and Ontario. Each plot consisted of three drills, each four rods long. The rows were 26.4 inches apart and the plants were thinned to an average of 12 inches in the row. The soil was a clay loam, upon which rape had been grown in 1892, and which was pastured off by lambs. Manure was applied at the rate of 15 tons per acre in the spring of the present year. The seed was sown on June 27, with a one-horse seed drill. Light ridges had previously been made with a double mould board plow. Great care was exercised in thinning the roots, and all the roots left of every variety were counted and thinned out to an exact number.

Yields of 54 varieties of Swede turnips:

Varieties.	Average soundness of roots, 2 years.	Results for 1893			Average results for number of years grown on plots.		
		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 three year		tons	lb.	tons.	tons	b.	tons.
1 Hartley's Bronze Top	medium ..	6.60	2.30	21.60	5.30	1.67	**21.17**
2 Carter's Prize Winner	" ..	7.59	2.23	22.30	5.59	2.22	**20.42**
3 Green Top	good	8.28	2.04	18.20	7.23	2.31	**20.10**
4 Bangholm	.....	6.90	1.98	18.30	5.95	2.26	**19.92**
5 Westbury's Improved	med. good	7.65	2.10	19.20	6.85	2.24	**19.91**
6 Sutton's Champion	"	5.08	2.00	17.00	4.83	2.37	**19.86**
7 Our Selected Purple Top	"	4.95	1.98	17.00	4.43	2.32	**19.80**
8 Marshall's Purple Top	med. poor	6.45	2.37	18.90	5.25	2 34	**19.79**
9 Skirving's Swede	medium ..	6.88	2.05	20.00	5.33	2.14	**19.58**
10 P. W. & Co's. Imperial Prize Purple Top	med. poor	6.23	2.08	18.80	6.56	2.33	**19.45**
11 Carter's Imperial Hardy	med. good	6.85	1.99	19.00	5.48	2.20	**19.43**
12 White Swede	medium ..	4.25	1.61	13.20	5.12	2.22	**19.42**
13 Laing's Improved	" ..	7.08	1.95	19.10	5.48	2.10	**19.29**
14 Hazard's Improved	med. poor	4.50	1.83	14.90	4.75	2.41	**19.17**
15 Sharpe's Improved	med. good	5.75	1.99	19 90	4.43	2.07	**19.12**
16 King of Swede's	good	6.28	1.90	18.10	5.56	2.20	**18.82**
17 Knowfield	medium ..	5.45	2.06	19.30	4.63	2.21	**18.81**
18 Highland Prize Purple Top	med. good	5.95	1.99	19.10	5.69	2.20	**18.79**
19 Hall's Westbury	med. poor	4.85	1.89	18.90	4 65	2.06	**18.41**
20 East Lothian	med. good	6.68	2 00	16.90	5.22	2.13	**18.19**
21 Maston's Purple Top	medium ..	5.00	1.77	18.25	5.38	2.00	**18.04**
22 Royal Norfolk Purple Top	" ..	4.85	1.94	17.95	3.93	2.11	**18.00**
23 Carter's Elephant	" ..	4.90	2.00	17.80	4.89	2.17	**17.51**
24 Drummond's Imperial	" ..	5.20	1.90	18.20	5.20	2.11	**17.47**
25 Fettecairn Green Top	med. poor	4.70	2.11	15.50	4.93	2.16	**16.74**
26 Marquis of Lorne Purple Top	med. good	4.58	2.01	18.60	4.62	2.02	**16.65**
27 Budlong's White Ruta Baga	"	4.35	1.73	19.55	3.50	1.76	**16.47**
28 White Rock	medium ..	4.88	1.74	16 80	3.89	1.77	**16.11**
29 White Sweet Russian	med. poor	5.75	1.73	17.45	4.78	1.84	**15.87**
30 Ashcroft's Purple Top	medium ..	4.88	2.15	16.85	4.02	1.96	**15.54**
Grown for two years:							
31 American Purple Top (Novelty Swede No. 2, 1892)	med. good	4.30	2.21	22.50	4 38	2.07	**21.40**
32 Edina (Novelty Swede No. 1, 1892)	"	7.30	2.18	21 05	7.54	2.16	**21.03**
33 Queen of Swedes	medium ..	4.80	2.22	21.40	5.30	2.06	**20.45**
34 Aroostock's Ruta Baga	" ..	4.78	1.77	18.30	5.57	1.85	**18.65**
35 Shamrock Swede	good	4.85	2.08	19 75	4.93	1.94	**18.53**
36 Laidlaw's Improved	medium ..	6.05	1.99	19.25	4.77	1.89	**18.10**
37 Crimson King	med. good	5.60	1.88	17.53	4.88	1.81	**17.39**
38 Rennie's Prize Purple Top	medium ..	5.85	2.07	18.55	4.97	1.93	**16 89**
Grown for one year:							
39 Kangaroo	poor.....	4.68	2.16	21.03	4.68	2 16	**21.03**
40 Bloomsdale	good	5 15	2.01	20 00	5.15	2 01	**20.00**
41 Scottish Champion	medium ..	4.50	1.81	19.15	1.50	1.81	**19 15**
42 Hurst's Monarch	" ..	4.38	1.89	18 20	4.38	1 89	**18.20**
43 Improved Long Island Ruta Baga	good	5.00	1.79	18.18	5.00	1 79	**18.18**
44 Golden Globe	medium ..	4.58	1.82	17 85	4.58	1.82	**17.85**
45 Yellow Montgomery	" ..	2.73	1.71	17 85	2.73	1.71	**17.85**
46 Jumbo or Monarch	good	4 63	1.85	17.60	4.63	1.85	**17.60**
47 Geo. Thorpe's Improved	"	4.25	1.77	16.85	4.25	1.77	**16.85**
48 N. B. & G. Co's. Prize Winner	"	4.35	1.92	16.50	4.35	1.92	**16.50**
49 Jarman's Improved King of the West Purple Top	"	3 83	1.85	16.48	3 83	1.85	**16.48**
50 White French	"	6.45	1.70	15.55	6.45	1.70	**15.55**
51 Maule's Heavy Cropping	poor	3.73	1.79	15.48	3.73	1.79	**15.48**
52 Premier	good	4.33	1.61	15.18	4.33	1 61	**15 18**
53 Sweet German Ruta Baga, or Swedish	"	6.25	1.50	14.63	6.25	1.50	**14.63**
54 Improved Yellow Purple Top	poor	3.30	1.58	12.20	3.30	1.58	**12.20**

The American Purple Top, which was mentioned in the 1892 report as Novelty Swede No. 2, has given a yield of 22.5 tons per acre, which is the highest yield for 1893. This is a new variety and one which promises to do well, as it gave very uniform results during the two years which it has been grown on our trial grounds. The Carter's Prize Winner stands second in point of yield among the 6 varieties grown during 1893. This was grown from seed imported from England. It stands second in yield per acre among 30 varieties grown for three years. The Hartley's Bronze Top gave the best average yield among the number grown for that length of time. The Kangaroo, also an English variety, heads the list in point of yield among the varieties grown at this station in 1893 for the first time. It will be remembered that the Hartley's Bronze Top was the variety which gave the best yield per acre among four varieties of Swedes which were tested by farmers in thirteen different localities over Ontario in 1892, giving an average of 783 6 bushels per acre at that time.

Swede Turnips, Thinning Plants in the Drill

A duplicate experiment was carried on in 1893 in growing Swede turnips at different distances apart in the drill. This was a continuation of a similar test conducted in 1892. The land used for the experiment in 1893 was a clay loam which had been cropped with rape the previous year, and manured at the rate of 15 loads per acre of well rotted farm-yard manure, previous to the preparation of the land for the experiment under consideration. Slight ridges were made with a double mould board plow and the seed was sown June 29 with a hand seed drill. The plants were thinned when about two inches high and left to the distances required for the experiment.

Distance between roots in the drill.	Average weight per root		Yield of tops per acre.		Yield of roots per acre.	
	1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.
	lb.	lb.	tons.	tons.	tons.	tons.
Unthinned	.34	.27	8.52	6 24	10.47	9.06
4 inches	.79	..	5.99	.. .	14 63	.....
8 "	1.31	1.46	6.06	5.34	14 72	17.63
12 "	1 67	1 72	5 34	4.50	13.47	15 18
16 "	2 35	2.27	5.37	4.33	14.78	15.10
20 "	2 47	2 46	4.71	4 13	12 39	13 20

It will be observed that the highest yield of roots per acre was produced by thinning the plants to 16 inches apart in the drill in 1893. This, therefore, was not the case in the previous year, as the average of the results from 1892 and 1893 show the highest yield per acre to be obtained from the plants which were thinned to 8 inches in the drill. The plants thinned to 8 inches apart have given an average yield of 4.3 tons per acre more than those which were thinned to 20 inches apart in the results of the two years' experiments. The unthinned plot gave the lightest yield of roots per acre of both years.

Swede Turnips, Different Distances Between Drills.

In this experiment Swede turnips were grown upon drills 20, 26 and 32 inches apart. The experiment was conducted in duplicate in 1893, and was similar to the one carried on in duplicate in 1892. Preparation of the land, including manuring, etc., was the same as mentioned in the experiment with thinning plants in the drills. The roots

were all thinned to the same distance apart, namely, an average of 12 inches. There were in all six plots in connection with this experiment in 1893, and each plot contained six rows four rods long. Seeding took place on June 29th.

Distance between drills.	Average weight per root.		Yield of tops per acre.		Yield of roots per acre.	
	1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.
	lb.	lb.	tons.	tons.	tons.	tons.
20 inches	1.54	1.49	5.49	4.83	15.15	15.86
26 "	1.82	1.81	5.01	5.05	12.77	15.04
32 "	1.64	1.93	4.64	4.37	10.75	13.82

It would be well when studying the results of this experiment to also observe the results of the experiments previously given in regard to growing Swede turnips with plants thinned to different distances in the row. It was mentioned above that the roots in the rows of this experiment were thinned to 12 inches apart. Where the rows were made 20 inches apart there were almost one-half more roots by weight than where the drills were made 32 inches apart. The largest roots were from the wide drills and the smaller roots from the narrow drills, while the medium sized roots were from the drills a medium distance apart. It will be observed that the tops of the Swede turnips were about one-third as much as the roots themselves.

Swede Turnips, Flat Versus Ridged Cultivation.

An experiment was carried on to show the difference between growing Swede turnips on the flat surface and upon ridged land. Four plots were selected and the experiment was conducted in duplicate. The land was similar to that used for the variety tests for Swedes. The rows were 26.4 inches apart, and the plants were in all instances thinned to 12 inches in the row. The seed was sown on June 28th.

Cultivation.	Average weight per root.	Yield of tops per acre.	Yield of roots per acre.
	lb.	tons.	tons.
Flat	1.5	6.9	12.2
Ridged	1.5	7.6	11.7

The experiment shows that the results are quite similar from both the flat and the ridged cultivation. The average weight per root from each was practically the same. There seems to be a slight increase of the tops per acre from the ridged cultivation. Experiments may be carried on extensively along these lines in the future.

Fall Turnips, Comparative Test of 37 Varieties.

In 1893, 37 varieties of fall turnips were grown. These are sometimes designated white and yellow fleshed turnips. Three rows of each variety four rods long were grown. The drills were 26.4 inches apart, and the plants were thinned to an average of

12 inches apart, thus making 198 plants of each variety, The cultivation of the land, including manuring, etc., was the same as in the case of the Swede turnips previously mentioned. The seeding of all varieties took place on June 28th.

YIELDS OF 37 VARIETIES OF FALL TURNIPS.

Varieties.	Average soundness of roots, 2 years.	Results for 1893.			Average results for number of years grown on plots.		
		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 three years:		tons	lb.	tons	tons	lb.	tons
1. Jersey Navet	med. spongy	4.08	2 22	20.00	4.22	2.63	**23.21**
2. Early American Purple Top	medium	4 53	2 36	24.65	4.82	2.39	**22.75**
3. Early Purple Top Munnick	"	4.23	2 23	23.73	2.59	2 32	**21.78**
4. Greystone Improved	"	4 50	2 30	19.58	6 34	2.83	**21.69**
5. Red Globe Norfolk	med. good	6 40	2 03	18 50	5 54	2 50	**21.66**
6. Greystone	medium	4 50	2.05	18.28	5 50	2 46	**21.59**
7. Red Top Strap Leaf	spongy	3 90	1.92	20 75	4 13	2.24	**20.91**
8. Purple Top Mammoth	medium	5.00	1.91	15.00	5 79	2.44	**20.14**
9. Pomeranian White Globe	spongy	5.10	1.96	17.18	6 93	2.16	**19.43**
10. White Stone	medium	3 13	1.93	17.00	3.58	2 19	**17.23**
11. Orange Jelly	"	2.20	1.34	10.05	3.05	2 01	**15.74**
12. Golden Ball	good	5.20	1 26	9.78	4.70	1.83	**14.41**
13. Yellow Aberdeen Green Top	"	3 58	1.45	11.93	3 86	1.61	**12.79**
14. Yellow Aberdeen Purple Top	med. to good	4.23	1.51	10.45	4.68	1.57	**12.10**
Grown for two years:							
15. Purple Top Mammoth or Improved Greystone	good	1 90	2.31	21 38	4 80	2.02	**17.88**
16. Imperial Green Globe	"	4.10	2.02	19.78	3.43	1.67	**15.34**
17. Purple Top Hybrid	"	5.53	1.50	11.25	4.09	1.25	**8.73**
Grown for one year:							
18. White Flat Dutch Strap Leaf	"	4.50	2.46	26 78	4.50	2.46	**26.78**
19. Cow Horn	"	3 55	2.31	24.90	3.55	2.31	**24.90**
20. Green Barrel	"	5 90	2 21	22.10	5 90	2 21	**22.10**
21. Jarman's Improved Green Top Yellow Scotch	"	5.25	2 10	21 53	5.25	2 10	**21.53**
22. Jersey Lily	"	6.00	2.25	20.25	6.00	2.25	**20.25**
23. Yellowstone	medium	3.10	1.87	19 38	3.10	1.87	**19 38**
24. Early White Model	good	3 48	1.93	19.25	3.48	1.93	**19.25**
25. American Bread-stone	"	6.00	1.76	17.58	6.00	1.76	**17.58**
26 Burpee's Breadstone	medium	7.75	1.71	17.38	7.25	1.71	**17.38**
27. Extra Early Milan	"	1 35	1.73	17.25	1 35	1 73	**17.25**
28. Jarman's Selected Green Globe	good	3 28	1.80	16.88	3.28	1.80	**16.88**
29 Sweet German	medium	5.88	1.55	16.75	5 88	1.55	**16 75**
30. Early Maltese	"	3 15	1.54	15 80	3.15	1.54	**15 80**
31. Fosterton Hybrid	good	6 80	1.47	14.00	6.80	1.47	**14.00**
32. White Six Weeks	medium	3 25	1.80	13.95	3.25	1.80	**13 95**
33. Dale's Hybrid	good	4.50	1 36	13 55	4.50	1.36	**13 55**
34. Sutton's Imperial Green Globe	medium	2.90	1.46	13.55	2 90	1.46	**13.55**
35. Amber Globe	good	4.30	1.41	12 50	4.30	1.41	**12.50**
36. Seven Top	"	6.20	.97	10.05	6.20	.97	**10.05**
37. Carter's Champion Green Top Scotch or Aberdeen Hybrid	medium	3.85	1.24	8 80	3 85	1.24	**8.80**

The Jersey Navet, which stands at the head of the list, gave a yield per acre of 28.23 tons in 1893, 21.38 tons in 1892 and 20.0 tons in 1893, thus making an average of 23.2 tons for the three years. The roots of this variety are medium long and the flesh is white. The Jersey Navet has given a yield of 4.65 bushels per acre more than the average of all the varieties grown for the past three years, and has also given a yield per acre of three tons per acre more than the average of all the varieties for 1893. The

seed of this variety was first imported from the United States in the spring of 1890. The Red Globe Norfolk, which was at one time considered to be the best yielding fall turnip now occupies the 5th place in yield per acre among fourteen varieties grown for three years, with a yield of 18.5 tons in 1893. No less than twenty new varieties were introduced and grown during the present year. Among these several very promising varieties seem to be present. The White Flat Dutch Strap Leaf heads the list not only of the new varieties but of the 37 kinds grown upon the plots. It gave a yield of nearly 27 tons per acre. It grows to a large size and almost entirely above the surface of the ground. The roots are flat in nature and the tops are light. In 1893 it gave a yield of 57 per cent. more than the average of all other varieties. It certainly promises well to be a variety which will produce heavily for autumn feeding.

Fall Turnips, Thinning Plants in the Drill.

A duplicate experiment was carried on in 1893 in growing fall turnips at different distances apart in the drill. This was a continuation of a similar test conducted in 1892. The land used for the experiment in 1893 was a clay loam which had been cropped with rape the previous year and manured at the rate of 15 loads per acre of well rotted farm yard manure previous to the preparation of the land for the experiment under consideration. Slight ridges were made with a double mould board plow and the seed was was sown June 29 with a hand seed drill. The plants were thinned when about two inches high and left to the distances required for the experiment.

Distance between roots in the drill.	Average weight per root.		Yield of tops per acre.		Yield of roots per acre.	
	1893.	Average 2 years 1892-3.	1893.	Average 2 years 1892-3.	1893.	Average 2 years 1892-3.
	lb.	lb.	tons.	tons.	tons.	tons.
Unthinned	.32	.36	10.02	11.48	14.15	14.20
4 inches	1.07	1 05	6.60	7.33	24.08	21.84
8 "	1.89	1.74	6.81	6.74	23.69	20.63
12 "	2.73	2.44	6.44	5.94	23.34	19.69
16 "	3.49	3.10	6.93	6.01	23.22	19.14
20 "	3.77	3.37	6.48	5.51	21.26	17.23

This experiment shows very nice results throughout, as there seems to be quite a regular system in the yield of roots from the different plots. The plots which had the roots thinned to four inches apart gave the highest yield per acre in both 1892 and 1893. From this there is a gradual decrease in yield until the widest thinning is reached. There was more than twice as great a yield of tops from the unthinned plot as from the plot which contained the roots thinned to 20 inches apart. The turnips which were thinned to 20 inches apart were more than three times the size of those thinned to only four inches.

Mangels, Comparative test of 49 Varieties.

Of the 49 varieties which have been grown upon the experimental plots, 30 kinds have been grown for three years, seven varieties for two years and 12 were grown in 1893 for the first time. The mangel seed was obtained from England, United States, Quebec and Ontario. The plots were 1-100 of an acre in size. The drills were 26.4 inches apart

and the rows were thinned to an average of 12 inches. The preparation of the soil, etc., were the same as in the case of the turnips previously mentioned. The seed was sown on the 22nd of May with a one-horse seed drill.

CORRECT YIELDS OF 49 VARIETIES OF MANGELS.

Varieties.	Average length of root.	Results for 1893.			Average results for number of years grown on plots.		
		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 three years:	in.	tons.	lb.	tons.	tons.	lb.	tons.
1. Carter's Champion Yellow Intermediate	7.6	2.28	1.49	15.15	3.61	2.33	**25.01**
2. Improved Mammoth Prize Long Red	10.5	3.45	1.44	15.10	3.95	2.11	**23.77**
3. Evan's Improved Mammoth Sawlog	10.8	3.23	1.43	15.20	3.76	2.18	**23.52**
4. Steele Bros. Long Red Selected	10.8	3.30	1.47	16.10	3.85	2.16	**23.49**
5. Elvetham Long Red	11.0	3.08	1.34	14.30	4.54	1.83	**22.78**
6. Carter's Mammoth Long Red	10.8	2.65	1.25	12.53	4.45	1.95	**21.84**
7. Norbitan Giant	9.8	3.05	1.23	13.25	3.77	2.05	**21.74**
8. Mammoth Red Intermediate	9.5	1.68	1.09	11.45	3.76	1.87	**21.30**
9. Eiffel Tower	10.3	2.60	1.25	13.00	3.45	1.98	**21.27**
10. Yellow Obendorf	7.9	2.28	1.26	13.25	2.84	1.75	**20.69**
11. New Monarch	6.9	1.10	.89	9.68	3.88	1.73	**20.25**
12. Colossal Long Red	10.9	2.48	1.07	11.33	3.84	1.85	**20.22**
13. Giant Holstein	11.1	2.98	1.19	12.58	3.99	1.87	**20.15**
14. Chirk Castle	10.6	2.18	1.10	11.53	3.09	1.72	**19.72**
15. Oblong Giant Yellow	9.3	2.28	1.15	12.20	2.42	1.83	**.41**
16. May's Mammoth Long Red	10.5	2.65	1.04	10.90	4.64	1.72	**19.08**
17. Yellow Oval-Shaped Giant	7.3	1.38	.80	8.45	1.94	1.66	**17.72**
18. Long Oxhorn	10.5	2.55	1.03	10.25	3.60	1.71	**17.58**
19. Carter's Warden Orange	6.2	1.53	.92	10.33	3.69	1.61	**17.38**
20. Yellow Globe	5.9	1.80	1.01	11.15	3.38	2.07	**15.69**
21. Red Oval-Shaped Giant	7.2	1.50	.76	8.43	2.18	1.64	**15.62**
22. Mammoth Golden Giant	6.8	1.68	.74	8.10	3.13	1.47	**15.05**
23. Red Globe	6.0	2.33	.94	10.15	2.51	1.48	**15.01**
24. Oblong Giant Red	9.0	1.53	.90	6.80	2.16	1.52	**11.98**
25. Golden Tankard	6.1	1.23	.75	8.10	2.07	1.37	**14.83**
26. Clark's Devon Orange Globe	6.4	1.78	.89	9.23	2.01	1.35	**14.58**
27. Fisher Hobb's Orange Globe	6.4	1.98	.88	9.50	1.88	1.40	**14.53**
28. Long Yellow	11.4	2.38	1.06	11.60	2.59	1.57	**14.53**
29. Kniver Yellow Globe	6.3	1.73	.83	8.93	1.81	1.33	**14.00**
30. Red Tankard	6.9	1.38	.88	9.50	1.64	1.32	**13.04**
Grown for two years:							
31. Sutton's Mammoth Long Red	11.2	3.33	1.27	13.63	4.41	1.66	**16.93**
32. Canadian Giant	11.2	2.45	1.14	12.08	3.65	1.39	**14.09**
33. Sutton's Golden Tankard	7.0	1.58	.93	10.00	2.46	1.34	**13.62**
34. Beck's Champion Globe	6.8	1.75	.88	9.38	2.44	1.35	**13.39**
35. Gate Post	11.4	2.85	1.11	11.43	2.93	1.28	**12.48**
36. Berkshire Prize Yellow Globe	6.5	1.58	.99	10.70	1.86	1.19	**11.89**
37. Sutton's Yellow Intermediate	7.1	1.43	1.07	11.18	1.39	1.05	**10.34**
Grown for one year:							
38. Jarman's Giant Long Red	11.8	3.60	1.45	15.83	3.60	1.45	**15.83**
39. Giant Yellow Intermediate	10.8	3.03	1.44	15.33	3.03	1.44	**15.33**
40. Yellow Leviathan	11.1	2.63	1.38	15.00	2.63	1.38	**15.00**
41. New Eschendorf	73	2.18	1.34	14.70	2.18	1.34	**14.70**
42. Sutton's Yellow Globe	6.6	2.15	1.29	14.20	2.15	1.29	**14.20**
43. Jarman's Model Yellow Globe	6.4	2.00	1.28	14.13	2.00	1.28	**14.13**
44. Jarman's Selected Golden Tankard	7.5	2.30	1.33	13.85	2.30	1.33	**13.85**
45. Jarman's Giant Intermediate	7.2	1.68	1.32	13.75	1.68	1.32	**13.75**
46. Yellow Ovid	9.2	2.88	1.25	13.33	2.88	1.25	**13.33**
47. English Prize	11.6	2.78	1.19	12.95	2.78	1.19	**12.15**
48 Olive Shaped Red	7.5	1.98	1.07	11.45	1.98	1.07	**11.95**
49. Ward's Oval	8.5	1.65	.92	10.10	.65	.92	**10.10**

The mangel crop was very light during the past year. The experiment, however, was a good one throughout, and the results are satisfactory, even though the yields are not heavy. The average yield per acre of 49 varieties in 1893 was 12 tons, while the average for the three years was over 16 tons per acre. The weather was too dry to favor a rapid growth of the roots during the past season. The Carter's Champion Yellow Intermediate gave a yield per acre in 1891 of 34.09 tons, in 1892 of 25.78 tons and in 1893 of 15.15 tons. The seed of this variety was imported from England, and a fresh supply was used each season. The flesh is of a pinkish yellow, and the roots are uniform throughout. It will be observed that this intermediate variety has given a larger average yield per acre than any of the long varieties, which have been supposed to be the greatest yielders of all the varieties of mangels. Among the globe varieties the Yellow Obendorf has given the largest yield per acre for three years. It gave an average of 20.69 tons, which places it 10th on the list of 30 varieties grown for that length of time. The Sutton's Mammoth Long Red, which heads the list among seven varieties introduced in 1892, and the Jarman's Giant Long, which heads the list among 12 varieties introduced in 1893, were both from seed imported from England. These varieties gave from two to four tons per acre more than the average of all the kinds grown during 1893.

Mangels, Thinning Plants in the Drills.

An experiment was conducted in duplicate in 1893 similar to the one carried on in 1892, in growing mangels at different distances in the drill. There were none, however, thinned to four inches apart in 1892. In 1893 there were five rows in each plot, and there were twelve plots in the experiment. The rows were 26.4 inches apart, and were four rods long. The land used was a clay loam, which had received a coating of fifteen loads of farmyard manure per acre in the spring of 1893. Rape was grown on the land in the previous year. Seeding took place on May 29, and the plants were thinned to their proper distances when about two inches high.

Distance between roots in the drill.	Average weight per root.		Yield of tops per acre.		Yield of roots per acre.	
	1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.	1893	Average 2 years, 1892-3.
	lb.	lb.	tons.	tons.	tons.	tons.
Unthinned	.32	.24	4.68	6.27	14.90	**15.18**
4 inches	.60	.....	3.03	.....	15 93	.....
8 "	.99	1.17	2.43	3.78	14.81	**17.07**
12 "	1.42	1.48	2.30	3.02	14 94	**15.26**
16 "	1.63	1.76	2 21	2.93	12.54	**13.66**
20 "	1.75	2.06	1.93	2.82	12.11	**13.56**

Mangels thinned to 8 inches apart in the row gave an average yield of 17.07 tons per acre, while those thinned to 20 inches gave an average of 13.56 tons per acre. This shows an increase of 3.51 tons per acre in favor of leaving roots comparatively thick in the row; but it will be observed that the thinner roots are nearly twice the size of those more thickly grown. The tops as well as the roots diminish in yield per acre as the distance between the roots becomes widened.

Mangels, Different Distances Between Drills.

This experiment was carried on in duplicate form in 1892, and also in 1893. Mangel seed was sown on the 29th of May upon drills made 20, 26 and 32 inches apart. There were six drills in each plot. The land was prepared in the same way as that for the variety tests, and the manuring was also similar.

Distance between drills.	Average weight per root.		Yield of tops per acre.		Yield of roots per acre.	
	1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.
	lb.	lb.	tons.	tons.	tons.	tons.
20 inches	1.24	1.45	2.92	3.46	16.70	**19.71**
26 "	1.60	1.67	2.96	3.89	16.25	**18.17**
32 "	1.83	1.89	3.00	3.66	16.48	**17.19**

The average results of this experiment for two years show that the largest yield per acre for roots was obtained from sowing mangels upon drills 20 inches apart, and the lightest yield per acre was from sowing mangels on drills 32 inches apart. There was a variation of 2.52 tons in favor of narrow drills. The roots, however, from the wide drills gave an average of 1.89 pounds apiece, while those from the narrow drills gave roots with an average of .44 of a pound less. It will be observed that the amount of tops of mangels as indicated is almost exactly one-fifth as much as the weight of the roots themselves.

Carrots, Comparative Test of 34 Varieties.

In 1892, 23 varieties of carrots were grown, and in the spring of the present year 10 new varieties were added to the list. The plots were each one one-hundredth of an acre, and were uniform in shape throughout. There were three rows, four rods long in each plot; no extra space was allowed between the plots. The land was prepared similarly to that for the turnips and mangels. The seed was sown with a small hand seed drill on the 20th and 22nd of May. The drills were 26.4 inches apart, and the plants were thinned to an average of four inches in the drill, thus making a total of 594 plants of each variety.

We were entirely unsuccessful with our experiments with carrots in the year 1891, owing to irregular germination in the spring on account of lack of moisture. No report, therefore, was given for that year. In 1892 a very successful experiment was carried on with 23 varieties of carrots. In 1893 the same 23 varieties were again grown, and in addition 10 new varieties. The average of the varieties grown for two years is 19.05 tons. There was a variation in yield among the varieties grown in 1893 of 20.5 tons per acre. Some of the smaller varieties, however, are garden carrots, and of course grow to a very small size. The Pearce's Improved Half Long White has given the largest average yield per acre for two years, namely, 23.04 tons. This was followed closely by Steele Bros'. Improved Short White, which gave an average of 22.29 tons per acre. These two varieties are very similar in all characteristics, the average weight per root for 1893 being exactly the same. The Improved Short White was sent out along with four other varieties to be tested by Ontario farmers in 1892. The co-operative results place the Improved Short White at the head of the list, the Large White Vosges coming second in point of yield. The six best yielding varieties in the station experiment for the past two years are all white in color. These are all quite easily removed from the ground, all being short varieties. The yellow variety which gave the largest yield per acre was the Danver's Orange, which gave an average of 25.8 tons per acre for two years, and 21.3 tons per acre in 1893. The Rubicon Half Long gave the largest yield among the new varieties grown in 1893 for the first time at this station. The seed of this variety was imported from the United States.

YIELDS OF 33 VARIETIES OF CARROTS.

Varieties.	Length of roots.	Results for 1893.			Average results for number of years grown on plots.		
		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 two years:		tons	oz.	tons.	tons	oz.	tons.
1. Pearce's Improved Half Long White	medium	7.80	13.2	29 58	9.00	14.4	**33.04**
2. Steele Bros.' Improved Short White	"	7.33	13 2	28 68	8.77	14 4	**32.29**
3. White Green Top Orthe	"	7.05	11 6	26.25	7.43	13 0	**29.43**
4. Large White Vosges	short med	5.23	10.8	23.63	6.87	12.3	**28.67**
5. Mastodon	medium	6.28	10.6	20.40	7.19	11.7	**27.60**
6. Simmer's Short White Vosges	"	5.28	9.9	20.93	6.34	11.9	**26 62**
7. Danver's Orange	"	4.13	8.9	21.28	4 82	10.7	**25.84**
8. Large White Belgian	long	5.45	8.4	18.98	7.48	11.2	**25.59**
9. P. W. & Co's Improved Giant Wiltshire White	"	5.48	10.1	18.48	8.34	12.5	**24.19**
10. Sutton's Yellow Intermediate	medium long	5.33	8 0	19.90	6.24	10.8	**23.50**
11. Giant Wiltshire	long	6.18	7.6	17 70	8 19	9.7	**23.45**
12. Guerande	short	2.73	6.7	17.40	3.72	8.4	**22.20**
13. Mitchell's Perfected	medium long	3.30	7.4	16.78	3.85	9 0	**21.14**
14. Scarlet Intermediate	medium	3.08	5.7	14.32	4.44	8.4	**20.41**
15. French Intermediate	"	3.80	6.1	15.23	5 25	7.8	**20.37**
16. Half-long Stump-rooted	short med	2.93	6.2	13.85	2.87	7 9	**19.83**
17. Sutton's Improved Intermediate	long	2.88	6.3	14 80	3 89	7.6	**18.40**
18. James' Scarlet Intermediate	medium	3 60	5.5	14.40	3.85	6.9	**18.20**
19. Carter's Orange Giant	medium long	1.55	9 6	8.55	3.38	10.3	**16.88**
20. Long Orange	long	5.03	5.5	12.43	7.17	6 4	**15.22**
21. Yellow Belgian	long	4.15	5.5	12.63	4.78	7 2	**15.17**
22. Long Red Surrey	long	3.75	4.9	12 33	3.63	6.6	**14 72**
23. Improved Large Long Red Altringham	long	2.13	3.9	8.65	5 62	6.00	**14.13**
Grown for one year:							
24. Rubicon Half long	short	3.38	6.0	16.23	3 38	6.00	**16.23**
25. Nichol's Improved Long Orange	long	3.98	6.3	15.63	3.98	6.30	**15.63**
26. Chantenay	short	2.85	5.4	14 78	2.85	5.40	**14.78**
27. Half long Scarlet	short	3.33	4 7	14 25	3.33	4.70	**14.25**
28. Long-red St. Vallery	long	3.35	6.1	13.80	3.35	6.10	**13.80**
29. Jarman's Scarlet Green Top	medium	3.00	6.3	12.43	3.00	6.30	**12.43**
30. Red Parisian Forcing	roundish	1.98	4.2	12.25	1.98	4.20	**12.25**
31. New Long Red Coreless	medium	2.38	4.1	11.40	2.38	4.10	**11.40**
32. Nante's Half-long Stump-rooted	short	2.13	6 3	11.00	2.13	6 30	**11 00**
33. Small French Forcing	round	.95	4.2	9.08	.95	4 20	**9.08**

CARROTS, THINNING PLANTS IN THE DRILL.

An experiment was carried on in growing carrots at different distances apart in the drill in 1892, and again in 1893. The experiment each year was conducted in duplicate. The land used in 1893 was a clay loam, coated in the spring with fifteen loads of farm-yard manure per acre, and then prepared in the same way as for the variety tests. The crop in 1892 was rape. There were twelve plots in all. Each plot contained one-sixtieth of an acre, and was divided into five rows each four rods long. The seed was sown with a hand seed-drill on the 29th of May, and the plants thinned to their proper distances apart when two inches high.

Distance between roots in the drill.	Average weight per root.		Yield of tops per acre.		Yield of roots per acre.	
	1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.
	lb	lb	tons.	tons.	tons.	tons.
Unthinned	.32	.20	6.42	7.35	23.76	**19.68**
2 inches	.47	.42	6.18	6.66	24.42	**22.24**
4 "	.76	.65	5.58	5.46	22.38	**18.79**
6 "	.94	.78	5.58	4.85	19.77	**15.94**
8 "	1.16	.92	4.65	4.13	17.88	**13.91**
10 "	1.23	.....	4.65	.....	15.60	.....

In 1892 there was no plot in the experiment in which carrots were thinned to ten inches apart. The results therefore are not given for that part of the experiment. The results are quite uniform in this experiment. Many people claim that one can get larger yields per acre by leaving roots at wide distances apart; this experiment does not point in this direction, as the yields are large on every plot, the lowest being almost 14 tons per acre and the highest being over 24 tons per acre. The plot which contained the carrots thinned to 2 inches apart contained about two-thirds more weight than the plot which had the roots thinned to 10 inches apart. This table is worthy of careful study. The results simply show that the thicker you leave the roots the greater yield per acre is received, and the thinner you leave the roots the larger sized carrots are obtained. This conclusion is drawn when the limits of thinning are 2 and 10 inches.

Carrots, Different Distances Between Drills.

Duplicate experiments were carried on in sowing carrots in drills 20, 26 and 32 inches apart in 1892 and also in 1893. The seed was sown May 29th, and when the plants were about two inches high they were thinned to an average of four inches in the row. The land was prepared for this experiment in the same manner as that for the variety tests with carrots. There were six rows in each plot and the rows were four rods long.

Distance between drills.	Average weight per root.		Yield of tops per acre.		Yield of roots per acre.	
	1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3	1893.	Average 2 years, 1892-3.
	lb	lb	tons.	tons.	tons.	tons.
20 inches	.63	.58	5.74	6.15	23.68	**23.56**
26 "	.74	.65	4.73	5.79	21 64	**21.60**
32 "	.73	65	4.14	5.10	17.44	**17.29**

In the experiment with carrots there is quite a marked increase in yield per acre when drills 20 inches apart are used instead of those 32 inches apart, when the plants were thinned as above mentioned. The question is whether the farmer would prefer to have an increase of 36 per cent. in his crop of carrots by having the drills 20 instead of 32 inches apart; but at the same time have carrots which are 12 per cent. smaller in size than those which he could obtain from the wider drills. It will be observed that the roots of the carrots were about $3\frac{2}{3}$ times as much as the tops of the same.

Sugar Beets, Comparative Test of 10 Varieties.

During the past two years 10 varieties of sugar beets have been grown in the comparative tests on the trial grounds. The plots were the same size as those used for the other kinds of roots There were three rows, four rods long, sown of each variety. The rows were 26.4 inches apart, and the roots were thinned to an average of 12 inches apart in the row. The preparation of the soil, including the manuring, etc., was exactly the same as for the other roots. The seed was sown on the 23rd of May with a one-horse seed-drill.

Yields of 10 Varieties of Sugar Beets.

Varieties.	Shape of root.	Results for 1893.			Average results for 2 years 1892-3.		
		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.
		tons.	lb	tons.	tons.	lb	tons.
1 White Silesian	Long	2.93	1.30	12.85	4.83	1.57	**15.28**
2 Red Top	Long	2.95	1.20	12.93	4.00	1.49	**15.28**
3 French White	Long	3.98	1.23	12.83	3.41	1 45	**14.51**
4 Vilmorin's Improved White	Long	3 53	1.14	11.88	5.33	1.40	**14.08**
5 Lane's Improved	Long	3.10	1.09	11.35	3.19	1.34	**13.78**
6 Champion	Long	3.13	1.08	11.70	3.98	1.27	**12.82**
7 Austria Electorial Wohanka	Medium	4.03	.95	10.30	4.99	1.12	**11.22**
8 Kleinwanz Lebei	Medium	4.55	1.17	11.75	4.65	1.10	**10.90**
9 Improved Imperial	Medium	2.50	1.59	8.73	3.85	1.33	**9 24**
10 Red Skinned	Long	2.40	.95	9.05	3.37	.92	**8.82**

The ten varieties of sugar beets gave an average of 11⅓ tons per acre during 1893, and an average of 12.6 tons per acre during 1892. The seed of all the varieties was obtained from Ontario and the United States. The comparative order of the yield per acre of the varieties grown in 1892 and in 1893 was quite similar. The White Silesian variety, which grows comparatively large, and one which has been grown to a certain extent for feeding purposes in Ontario, occupies a high place in the list in regard to yield. In 1892 it gave the largest yield per acre, and in 1893 it was surpassed by only one variety. The roots are rather long in shape, white in color, and rather of a fairly uniform quality. Vilmorin's Improved White, another variety which has been grown in Ontario for stock feeding, stands fourth in point of yield per acre of roots. This variety has produced the largest amount of tops of any of the varieties grown for the past two years. A great objection to growing sugar beets is the difficulty there is in removing them from the land. Owing to their fibrous roots they are difficult to pull. There is not much difference between the various varieties of sugar beets in this respect.

SILAGE AND FODDER CROPS.

The experiments which have been conducted during 1893 with silage and forage crops are mostly included under the following heads: Fodder corn, millet, clover, grasses, mixed grains, rape and sunflower. No less than 240 plots were devoted to experiments with fodder corn during the last year, and the results of this line of work have been quite successful. A review of our experience with grains for the past 12 years is given in the report on that subject.

Fodder Corn, Comparative Tests of 93 Varieties.

Varieties.	Kind of Corn.	Average yield of whole crop per acre, 1893.	Average results for number of years grown on plots.			
			Condition of grain when harvested.	Average weight per ear when harvested.	Yield of ears per acre when harvested.	Yield of whole crop per acre.
Grown for Three Years.		tons.		tons.	oz.	tons.
1. Mammoth White Surprise	White Dent	23.30	Water	3.48	.84	**22 60**
2. Brazilian Flour	"	22.30	"	1.46	.36	**22.07**
3. Chester Co. Mammoth	"	23.70	"	3.30	1.13	**21 80**
4. Cloud's Early Yellow	Yellow Dent	24.70	Late milk.	7.12	3.76	**21.50**
5. Thoro' bred White Flint	White Flint	24.60	Milk	4.43	1.71	**21.43**
6. Mastodon Dent	Yellow Dent	23.25	"	6.55	3.03	**21.05**
7. Mammoth Sweet Fodder	White Sweet	24.90	Early milk	5.26	2.50	**20.87**
8. Blunt's Prolific	White Dent	22.65	"	3.32	1.15	**20.82**
9. Virginia Horsetooth	"	24.35	Water	2.67	1.02	**19 98**
10. Improved Leaming	Yellow Dent	22.05	Dough	5.47	3.13	**19.85**
11. Golden Beauty	"	22.65	Milk	5.02	2.51	**19.42**
12. Mammoth White Cob Ensilage	White Dent	24.15	Early milk.	3.99	1.65	**19.15**
13. Red Cob ensilage	"	23.35	"	3.65	1.25	**19.12**
14. Giant Prolific S. Ensilage	"	20.05	"	5.23	1.97	**18.95**
15. Horsetooth	Yellow Dent	19.95	Late milk.	5.57	2.98	**18.92**
16. Mammoth Southern Sweet	White Sweet	21.05	Early milk.	4.33	1.76	**18.85**
17. Mammoth Cuban	Yellow Dent	20.25	Dough	6.80	3.76	**18.82**
18. Centennial White	White Dent	21.05	Late milk.	6.17	3.10	**18.55**
19. Hickory King	"	24.00	Early milk.	2.60	.92	**18.30**
20. Salzer's North Dakota	White Flint	19.70	Firm dough	5.10	2 93	**17.43**
21. Sheep's Tooth	White Dent	12.40	Early milk.	5.76	1.34	**17.23**
22. Hickox Sweet	White Sweet	20.40	Milk	5.51	2.68	**17.13**
23. Salzer's Superior Fodder Ensilage	White Dent	19.20	Early milk.	4.74	1 68	**17.00**
24. Evergreen Sweet	White Sweet	19.70	Milk	5.08	2.25	**16.93**
25. Improved Clarage	Yellow Dent	18.55	Late milk.	6.17	3.09	**16.72**
26. Tuscarora	White Flint	19.83	Dough	5 90	2.99	**16.71**
27. Large White Flint	"	19 50	Ripe	5.09	3.09	**16.70**
28. Salzer's South Dakota	Yellow Flint	17.00	"	4.96	3.04	**16.67**
29. Egyptian Sweet	White Sweet	19.85	Milk	3.88	1 75	**16.58**
30. Clarke's County Champion	White Dent	18.10	Late milk.	5.70	2.76	**16.23**
31. Sweet Fodder	White Sweet	20.40	"	4.54	1.07	**16.03**
32. White Flour	White Flint	18.70	"	3.65	1.67	**15.97**
33. Wisconsin Earliest White Dent	White Dent	18.15	Dough	7.32	3.51	**15.95**
34. Stowell's Evergreen Sweet	White Sweet	18.80	Milk	4.56	2 07	**15.63**
35. Compton's Early	Yellow Flint	16.45	Ripe	6.05	3.34	**15.62**
36. Northern White Pearl	White Dent	14.20	Late milk.	6.03	2.52	**15.40**
37. Old Colony	White Sweet	19.50	"	4.52	2.42	**15.30**
38. Longfellow	Yellow Flint	16.85	Ripe	5.09	2.86	**15.22**
39. Queen of the Prairie	Yellow Dent	15.85	"	4.02	3.37	**15.05**
40. Early Butler	"	16 80	Dough	6.69	3.08	**15.00**
41. Angel of Midnight	Yellow Flint	17.55	Ripe	4.99	2.65	**14 82**
42. Early Adams or Burlington	White Dent	15.15	Dough	5.04	2.58	**14.25**
43. Pride of the North	Yellow Dent	16.21	Mature	4.98	2.78	**14.07**
44. Late Mammoth Sweet	White Sweet	16.45	Milk	4.42	1.93	**14.05**
45. Golden Dewdrop	Yellow Flint	15.50	Ripe	5.21	2.91	**13.83**
46. Marblehead Mammoth	White Sweet	15.05	Late milk.	4.75	2.12	**13.78**

FODDER CORN, COMPARATIVE TESTS OF 93 VARIETIES.—*Continued.*

Varieties.	Kind of Corn.	Average yield of whole crop per acre, 1893.	Average results for number of years grown on plots.			
			Condition of grain when harvested.	Average weight per ear when harvested.	Yield of ears per acre when harvested.	Yield of whole crop per acre.
Grown for Three Years.		tons.		tons.	oz.	tons.
47. Wauskakum	Yellow Flint	15.40	Ripe	4.97	2 76	**13.40**
48. Canada Yellow	"	16.10	"	5.50	2 86	**13.40**
49. Dakota Dent	Yellow Dent	14.00	"	5 81	3.19	**13.30**
50. Golden Dent	"	13.95	"	5.10	2.58	**12.98**
51. Early White Flint	White Flint	14.00	"	5.45	2.79	**12.77**
52. Self-Husking	Red Yellow Flint	16 05	"	4.69	2 71	**12.75**
53. 100-day corn	Yellow Flint	16.25	"	4.80	2.67	**12.65**
54. Queen of the North	Yellow Dent	14.55	"	5.00	2.77	**12.35**
55. Minnesota King	"	14.10	"	5.39	2.81	**12.03**
56. Pearce's Prolific	Yellow Flint	16.25	"	4.57	2.04	**11.92**
57. Crosby	White Sweet	15.20	Late milk	4.24	2.6	**11.80**
58. King of the Earlies	Yellow Dent	11.25	Ripe	5.84	2.68	**11 58**
59. Ridout or Mercier	Yellow Flint	13.25	"	5.53	2.74	**11.15**
60. Smutnose	White Pink Flint	13.25	"	5.80	2.99	**11.08**
Grown for Two Years.						
61. Giant Beauty	Yellow Dent	19.50	Milk	7.75	3.68	**22.95**
62. Dr. Woodhull	"	21.20	"	6.88	3.16	**21.50**
63. Pride of Kansas	"	22.45	"	5.43	2.27	**21.43**
64. N. B. & G. Co's. Giant Fodder	White Dent	21.30	Early milk.	4.43	1 54	**20.95**
65. New Learning	Yellow Dent	17.05	Late milk	6.55	3 31	**19.38**
66. Mammoth	White Sweet	18.10	Early milk.	6.45	2.89	**19.30**
67. True Leaming	Yellow Dent	18 00	Late milk	7.62	3 66	**18.80**
68. Wilson's White Prolific	White Dent	19.15	Milk	6.91	3.31	**18.53**
69. Silver Flint	White Flint	6.69	Ripe	5.24	3.17	**13.45**
Grown for One Year.						
70. Peach Blossom Mammoth Fodder	Pinkish Dent	25.45	Early milk.	6.79	3.08	**25.45**
71. Champion Pearl	White Dent	23.55	Milk	7.30	3 95	**23.55**
72. Evergreen Red Cob	"	21.35	Early milk.	4.74	1 85	**21.35**
73. Mammoth Sweet for Ensilage	White Sweet	21.05	Milk	7 70	3.03	**21.05**
74. Elephant Fodder	Yellow Dent	20.55	"	6 37	3.12	**20 55**
75. Kansas King	White Dent	20.30	Early milk.	4.71	1 81	**20.30**
76. Giant White Southern	"	20 05	"	5 58	2 63	**20.05**
77. Boone County White	"	20.05	"	5.62	2.23	**20.05**
78. Jas. Stewart	Yellow Dent	20.00	Milk	7 38	3.44	**20.00**
79. Red Blazed	Reddish-yellow Dent.	19.70	Ripe	7 06	3.93	**19.70**
80. Geo. Hondeshell	Yellow Dent	19.70	Milk	6.03	2.94	**19.70**
81. Legal Tender	"	19.45	Late milk	5.65	2.83	**19.45**
82. Improved Calico	White Dent	19.30	"	7.07	3.38	**19.30**
83. Big Buckeye	Yellow Dent	18.75	Milk	5.76	2.45	**18.75**
84. Dungan's White Prolific	"	18.60	Early milk.	5.64	2 06	**18.60**
85. Early Snow-storm	White Dent	18.40	"	6.95	2 48	**18.40**
86. Queen of the Field	Yellow Dent	18.05	Dough	8.17	3 98	**18.05**
87. Iowa Gold Mine	"	17.05	Late milk	6 41	3.03	**17.05**
88. N. B. & G. Co's. Rustler White Dent	White Dent	16.85	Dough	8.41	4 13	**16 85**
89. Dakota Queen	Yellow Dent	14.90	Ripe	7.05	4.08	**14.90**
90 Extra Early Huron Dent	"	14.30	"	6.31	3 39	**14.30**
91. Clark's Mastodon	"	10.00	Early milk.	9.68	1.33	**10.00**
92. Zig-Zag Evergreen	White Sweet	9.10	Milk	3.75	.84	**9.10**
93. Farmer's Favorite	Yellow Dent	5.40	Early milk.	9.83	.83	**5.40**

During the past year 93 varieties of fodder corn were grown on duplicate plots in the Experimental department. The seed was mostly obtained from the United States, but some were procured in Ontario. The land upon which the varieties of fodder corn were grown was a fairly uniform strip of clay loam, having a fairly level appearance Rape was on the land in 1892, and was pastured off by lambs. A coating of 15 loads per acre of farmyard manure was applied to the land in the spring of 1893, after which the land was plowed The soil was quite similar for each set of plots which were to be devoted to the testing of these 93 varieties. Each strip received exactly the same attention throughout. The same varieties, when growing in the duplicate plots, would be located about 20 rods apart. The corn was planted in hills 5 links (39.6 inches) apart both ways. Eight grains were placed in each hill, and after the plants were four inches high they were removed, leaving exactly four plants per hill. The planting of one set took place on May 26, and one of the other set May 27, with the exception of the following varieties, namely: Big Buckeye, Hondeshell and Stewart, which were planted on June 3rd. Thorough shallow cultivation was given the corn in both directions throughout the season.

It will be observed from the table, giving the report of 93 varieties of fodder corn, that not only is the yield per acre of the whole crop given for 1893, but the average results for the number of years, that all the varieties have been grown upon the plots, are also mentioned in a very concise way. Sixty of the varieties have been grown in duplicate plots for three years, nine have been grown in duplicate plots for two years and the remaining twenty-four were grown on duplicate plots in 1893 for the first time. The average results given in the table for the number of years which the varieties have been grown have reference to the condition of the grain when harvested, average weight per ear, yield of ears per acre and yield of whole crop per acre. This table gives information regarding a large number of varieties of fodder corn which have been grown in no other place in Canada except on this Farm. Some of these varieties have been grown for the past three years, the results carefully recorded and the reports now show that they are worthy of careful consideration. There has, perhaps, been no summary report on fodder corn given which is of so much value to the Ontario farmer as the one herein contained. We find that the variety which gave the largest total yield per acre in 1893 was the Peach Blossom Mammoth Fodder. The seed of this variety was imported from the United States. It is a dent variety and possesses a large ear. It is, however, rather late for this climate, but in some of the southern counties of Ontario it may do well by reaching a more advanced stage of maturity. Among the sixty varieties grown for three years the Mammoth White Surprise heads the list in total weight of green crop per acre. It gives an average of 22.6 tons. It is, however, very late and not well suited to the conditions of growth in this section of the country. The same may be said of the Brazilian Flour, which comes next in point of yield, and also in regard to the Chester County Mammoth following closely after, with a yield of 21.8 tons per acre. Cloud's Early Yellow is one of the earliest of the very large varieties. It produces large ears and they are very numerous. During the past three years the Cloud's Early Yellow gave an average of 3.76 tons of green ears per acre. This, however, did not go beyond the late milk condition. The Thoroughbred White Flint, of which much has been said in Ontario, is even later with us than the Cloud's Early Yellow. It has also been somewhat deficient in weight of ears The Improved Leaming, which is tenth in point of yield, has reached the dough stage year by year. It produces a nice ear and the ears are quite numerous on the stocks. This is a good variety when grown in sections when it will reach a sufficient stage of maturity. The Mammoth Cuban, which comes seventeenth on the list, also possesses corn which reaches a dough stage. It produces somewhat greater weight of green ears per acre than the Improved Leaming. This variety has done quite well both on this Farm and the co-operative experiments over Ontario. We consider it one of the best varieties, among the larger kinds. Salzer's North Dakota which stands twentieth on the list gives a somewhat lower total yield per acre; but it reaches a stage nearer to maturity when time approaches for harvesting for the silo. With us this variety is sufficiently ripened when corn is being cut for the silo.

The seed of a few of the varieties did not germinate well in the spring of the present year. It was our aim to leave an average of four per hill of all varieties. With some of

the kinds this could not be done. The following list gives the varieties which were deficient in germination, and also the percentage of plants which were lacking in the growing crop: Farmer's Favorite, 90; Zig-Zag Evergreen, 81; Sheep's Tooth, 77.5; Clark's Mastodon, 72.5; Northern White Pearl, 72.5; Marblehead Mammoth, 54; Early Snow-Storm, 37.5; Stowell's Evergreen, 36; King of the Earlies, 35; Salzer's Superior Fodder Ensilage, 35; White Flour, 27.5; Mammoth Sweet, 26; Old Colony, 22.5, and late Mammoth, 21.

The variety which reached the greatest height in 1893 was the Mammoth White Cob Ensilage, the plants being 130 inches in length. The Chester County Mammoth, Cloud's Early Yellow, Mastodon's Dent, Blunt's Pacific, Virginia Horse Tooth, Red Cob Ensilage, Hickory King, N. B. & G. Co's Giant Fodder, Evergreen Red Cob and Mammoth White Cob Ensilage each reached an average height of over 120 inches. The Marblehead Mammoth, Crosby, Smutnose and Silver Flint each reached an average height of less than 80 inches. The longest ears were produced by the Salzer's South Dakota, Red Blazed, Canada Yellow, Self-husking, Thoroughbred White Flint and Salzer's North Dakota, and the shortest ears were produced by the Brazilian Flour, Crosby, Mammoth, Evergreen Red Cob, Big Buckeye, Dakota Queen and Extra Early Huron Dent. The greatest weight of grain per ear was produced by the Early Butler, True Leaming, Compton's Early, Longfellow, Canada Yellow and Smutnose. About forty out of the ninety-three varieties produced grain which was quite hard in character when shelled during November.

Among all the varieties grown for the past three years we might mention the following as among the best for the conditions of Ontario, namely; Improved Leaming Mammoth Cuban, Salzer's North Dakota and Wisconsin Earliest White Dent.

Fodder Corn, Different Distances Between Drills and Between Plants in Drills.

In this experiment three varieties of corn were grown—an early, a medium and a late variety. Each variety was grown at different distances between the drills, namely,—30, 36 and 42 inches respectively, and the corn in each set of the drills planted at the distances mentioned above, was also planted at different distances, apart in the drill, namely, 4, 8 and 12 inches respectively. Two grains of seed were put in where but one plant was desired, and when necessary one plant was removed from each place when about three inches high. All the varieties were grown on duplicate plots and each of the test plots comprised five rows. The soil was a light clay loam upon which no manure had been applied for several years. Planting took place on June 3rd.

This experiment shows that in every case the highest total yield was obtained from planting in drills thirty inches apart and thinning to four inches in the drill in 1893 as in 1892. The largest average ear of the Mammoth Southern Sweet was obtained from planting in drills thirty six inches apart and thinning to twelve inches in the drill. The largest average ear of the Wisconsin Earliest White Dent was obtained from planting in drills forty-two inches apart and thinning to twelve inches in the drill. It will be observed that the thickest seeding of the Compton's Early gave an average of over two tons per acre total weight, and two tons per acre of ears more than the thinnest seeding of the Mammoth Southern Sweet for two years. The greatest total yield per acre for two years was produced by planting the Mammoth Southern Sweet in drills thirty inches apart, and thinning to four inches in the drill, and the greatest yield of green ears per acre for two years was produced by planting Wisconsin Earliest White Dent in rows thirty inches apart and thinning plants to twelve inches in the drills.

YIELD OF FODDER CORN GROWN AT DIFFERENT DISTANCES BETWEEN THE DRILLS AND BETWEEN THE PLANTS IN THE DRILLS.

Distance between drills.	Distance between plants in the drill.	Average weight per ear.		Yield of ears per acre.		Yield of whole crop per acre.	
		1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.	1893.	Average 2 years, 1892-3.
		oz.	oz.	tons.	tons.	tons.	tons.
Mammoth Southern Sweet :							
30 inches	4 inches.	2.13	2.89	1.29	1.32	19.07	23.04
	8 "	2 85	3.25	1.17	1.42	17.33	19.99
	12 "	3.07	3.79	1.21	1.59	13.66	17.62
36 inches	4 "	2.17	2.81	.73	.80	16.31	18.54
	8 "	3.16	3.76	1.37	1.60	15.50	18.41
	12 "	3.50	4.55	1.22	1.64	12.79	16.33
42 inches	4 "	1.81	2.86	.56	.96	12.81	17.75
	8 "	2.71	3.63	.91	1.46	12.48	16.91
	12 "	3.01	4.31	.92	1.53	11.25	16.09
Wisconsin Earliest White Dent :							
30 inches	4 "	2.56	3.81	2.58	3.76	14.58	19.78
	8 "	4.38	5.80	3.01	3.75	13.60	16.44
	12 "	5.73	7.94	2.89	3.97	12.89	15.41
36 inches	4 "	2.59	3 79	1.96	2.87	12.75	16 31
	8 "	6.46	7.45	2.86	3.81	13.16	16.06
	12 "	6.43	8.77	2.65	3.55	11.56	14.28
42 inches	4 "	2.96	4.36	2.03	3.36	11 65	16.53
	8 "	5.20	7.08	2.59	3.61	12 43	15.63
	12 "	6.63	9.20	2.49	3.44	10.87	13.43
Comptons' Early :							
30 inches	4 "	2.60	3.69	3.30	3.65	16.23	18.42
	8 "	4.22	5.27	3.25	3.67	14.08	15.60
	12 "	5.16	6 52	2.82	3.45	12.66	14.59
36 inches	4 "	3.07	3.74	3.02	3.24	14.27	15.67
	8 "	4.98	6.06	3.12	3.63	13.19	14.75
	12 "	5.78	7.19	2.69	3.22	11.74	13.65
42 inches	4 "	2.74	3.82	2.37	3.08	10.96	13.66
	8 "	4.91	6.24	2.62	3.34	11.18	13.28
	12 "	5.05	6.87	2.25	3.09	10.90	13.11
Average of the three varieties :							
30 inches	4 "	2.43	3.46	2.39	2.91	16.63	20.41
	8 "	3.82	4.78	2.48	2.95	15.00	17.34
	12 "	4.65	6.08	2.31	3.00	13.07	15.87
36 inches	4 "	2.61	3.45	1.90	2.30	14.44	16.84
	8 "	4.87	5.76	2.45	3.01	13.95	16.41
	12 "	5 24	6.84	2.20	2.80	12.03	14.75
42 inches	4 "	2.50	3.68	1.65	2.47	11.81	15.98
	8 "	4.27	5.65	2.04	2.80	12.03	15.27
	12 "	4.90	6.79	1.89	2.69	11.01	14.21

Millet, Comparative Test of Twelve Varieties.

In 1893, ten varieties of millet were grown. The plots were all one one-hundreth of an acre in size. The land was a clay loam and had not received any manure since the spring of 1890. The seed was sown broadcast at the rate of forty pounds per acre and was harrowed in with a light iron harrow. Another set of millets was sown at the same time for the purpose of harvesting for seed. The early frosts, however, froze some of the late varieties and made the experiment a comparative failure for this year.

Varieties.	Yield of green crop per acre.		
	1892.	1893.	Average for number of years grown.
	tons.	tons.	tons.
1. Salzer's Dakota	7.50	8.70	**8.10**
2. German or Golden	5.93	8.85	**7.39**
3. Golden Wonder	5.56	7.85	**6.71**
4. Common	2.38	8.43	**5.41**
5. White French	3.14	7.40	**5.27**
6. Pearl	4.61	4.40	**4.51**
7. Red French	3.88	5.05	**4.47**
8. Broom Corn	2.66	1.95	**2.31**
9. Western Grown	.....	10.78	**10.78**
10. Hungarian Grass	.....	7.40	**7.40**
11. African	4.88	.....	**4.88**
12. Siberian	3.61	.....	**3.61**

The Salzer's Dakota Millet, which heads the list in yield per acre for two years, is certainly an excellent variety. It did not do quite so well comparatively in 1893 as it did in 1892. It is a very strong growing variety and produces a large amount of foliage. It grows to a greater height than any of the other varieties and stands up remarkably well. Of the millets which have been grown on this Farm for two years, Salzer's Dakota has certainly shown itself to be a most desirable variety. The Western Grown did very nicely during the present year, giving a large yield per acre. In three co-operative tests over Ontario in 1892 in which three varieties of millets were grown, the Salzer's Dakota gave an average yield per acre of nearly fifty per cent. over either of the other varieties.

Mixed Grains, Grown for Fodder Purposes.

An experiment was conducted in growing grain in mixture for fodder purposes. Eleven plots were sown with two, three or four kinds of grain on each plot. The experiment was conducted in duplicate. Each plot was one one-hundredth of an acre in size. The soil was a clay loam which had received no manure since the spring of 1890, since which time it has been cropped each year. Seeding took place on May 13th. Besides growing the grain in mixtures each kind was grown by itself. When grown singly the same quantity of seed per acre was used as in the variety tests. When the grains were grown in mixtures, in the case of one set of experiments two-thirds the amount of seed was used of each kind of grain as was used in the variety tests. In the case of the other set, one-half the amount of each kind of grain was used as in the variety tests when two were sown together; one-third as much when three were sown together; and one quarter as much when four were sown together.

The largest yield per acre of green crop produced in 1893 was from growing oats, peas and wheat together; the second largest from growing oats and barley; and the third largest from growing oats and peas. The largest yield for the average of two years, however, was produced from growing a mixture of oats and peas. In the results of 1893, the yield per acre of green fodder from the mixture of grain gave about the same average as from similar grains grown separately. There is an advantage, however, in growing the grains in mixtures for fodder purposes, for in so doing a better balanced ration is thus obtained.

YIELDS OF GRAIN CROPS GROWN IN MIXTURES FOR FODDER PURPOSES.

Crops.	Yield of green crop from grains sown separately, 1893.	Average yield of green crop from mixed grains.		
		1892.	1893.	Average two years, 1892-3.
	tons.	tons.	tons.	tons.
1. Peas and Oats	6.04	10.95	6.01	8.48
2. Barley, Peas and Oats	5.52	9.95	5.30	7.63
3. Peas, Wheat and Oats	5.47	8.20	6.94	7.57
4. Barley and Peas	5.07	8.50	5.93	7.22
5. Barley, Peas, Wheat and Oats	5.25	9.85	4.01	6.93
6. Barley, Wheat and Oats	5.08	8.60	4.77	6.69
7. Barley and Oats	5.46	7.08	6.12	6.60
8. Wheat and Oats	5.38	7.58	5.28	6.43
9. Peas and Wheat	1.99	7.95	1.48	4.72
10. Barley, Peas and Wheat	4.82	7.45	3.98	5.72
11. Wheat and Barley	4.49	6.15	4.81	5.48

PEAS AND OATS ALSO VETCHES AND OATS, SOWN IN DIFFERENT QUANTITIES FOR FODDER PURPOSES.

In this experiment nine plots were sown with oats and peas, and nine plots with vetches and oats, mixed in varying proportions. The plots were each one-eightieth of an acre in size. The land had received no manure for several years. Grape vines were removed in the autumn of 1892 from the soil on which these mixtures were grown. Seed was sown broadcast on May 12th, and was covered by means of an iron harrow.

Mixtures of Grain.	Yield of green crop per acre.			Average yield of green crop per acre from three tests.
	Peas and Oats, 1892.	Peas and Oats, 1893.	Vetches and Oats, 1893.	
	tons.	tons.	tons.	tons.
Oats 2 bush., Peas or Vetches 3 bush. per acre	11.75	6.52	9.16	9.14
" 1½ " " 3 "	11.40	5.72	7.88	8.33
" 1½ " " 2 "	11.85	5.88	7.12	8.28
" 1 " " 3 "	11.35	6.32	6.93	8.20
" 2 " " 1 "	11.55	6.28	6.64	8.16
" 1 " " 1 "	11.80	4.68	7.04	7.84
" 1½ " " 1 "	12.10	4.88	6.52	7.83
" 2 " " 2 "	10.10	5.36	7.52	7.66
" 1 " " 2 "	10.75	4.18	7.56	7.50

In 1892, the greatest yield of green crop was produced from growing a mixture of one and one-half bushels of oats and one bushel of peas. This was upon land which had been manured two years previously. In 1893, the mixtures were grown upon land which had received no manure for a number of years. It was, therefore, of a poor quality, and the yields of green crop were quite small. The greatest yield per acre in 1893 was produced by sowing two bushels of oats and three bushels of peas, or two bushels of oats and three bushels of vetches per acre. It will be observed from these results that a good deal depends upon the state of fertility of the land when determining what quantity of seed should be used for growing crops such as these.

Special Varieties of Grain Grown in Mixture for Fodder Purposes.

An experiment was conducted in 1893, in which special varieties were sown in combination for the purpose of producing green crops. The plots upon which these mixtures were grown were each one one-hundredth of an acre in size. The land had received a coating of fifteen loads of farm-yard manure per acre in the spring of 1890. The seed was sown broadcast on May 19th, and the crops were harvested just when the varieties headed out.

Grains used in mixtures.	Remarks.	Yield of green crop per acre.
		tons.
Golden Giant Oats and McLean's Advancer Pea	Pea crop a failure	6.78
" " Canada Cluster Pea	One of the best	7.33
" " Prussian Blue Pea	One of the best	8.03
" " Grass Pea	Pea crop smothered out	6.08
Red Spot " McLean's Advancer Pea	Pea crop a failure	4.40
" " Canada Cluster Pea	Badly lodged	5.18
" " Prussian Blue Pea	Badly lodged	4.83
" " Grass Pea	Considerably lodged	4.43
Joanette " McLean's Advancer Pea	Pea crop a failure	5.38
" " Canada Cluster Pea	Good quality of feed	5.28
" " Prussian Blue Pea	Good quality of feed	5.98
" " Grass Pea	A fair crop	6.03
White Tartarian " McLean's Advancer Pea	Pea crop a failure	6.05
" " Canada Cluster Pea	Somewhat lodged	5.90
" " Prussian Blue Pea	Considerably lodged	5.73
" " Grass Pea	Pea crop smothered badly	6.13

The Golden Giant oats and Prussian Blue peas, when sown in combination gave the largest yield of green crop per acre, and the Golden Giant oats and the Canada Cluster peas gave the second highest yield per acre. Both of these mixtures have been found to give good satisfaction, and for general purposes it is perhaps difficult to find a mixture which is more suitable for fodder purposes than the Golden Giant oats and the Prussian Blue peas. If a crop of finer growth is required and one which would perhaps be well suited for curing for sheep feed in the winter, the Joanette oats and the grass pea would perhaps be the best mixture of all those which have been tried.

Sunflower, Comparative Test of Two Varieties.

In 1893 two varieties of sunflower were grown side by side. The seed was planted in rows twenty-five inches apart, on May 22nd. The land was cultivated similar to that upon which corn was grown.

Varieties.	Yield of green sunflower per acre.		
	Heads.	Leaves.	Whole plants.
	tons.	tons.	tons.
Russian Giant	8.80	3.16	19.44
Common	6.00	1.68	13.20

The weight per acre of the whole crop of each variety was estimated from the amount of the total crop produced on each plot. Correct weights of the heads of each variety were also taken, and also those of the leaves. The results show that the Russian Giant sunflower produced a greater total weight than the common variety, and also has greater weights of heads and leaves per acre.

Rape, Comparative Test of 11 Varieties.

Eleven packages of rape seed were presented to us by the Messrs. Steele, Briggs, Marcon Co., seedsmen, Toronto, in the spring of 1893. The seed was sown in single rows, 25 inches apart, and one rod long. The experiment was conducted in duplicate. The seeding of the first set took place on the 26th of May, and the latter one about five weeks after. The ground was kept clean by means of the hoe throughout the season. Notes were taken, and the crop cut on the 13th of October.

Varieties.	Remarks.	Average height of plants.
		Inches.
1. Large Seeded Summer Rape	Long, slender and flowering	35
2. Dutch Rape, Large Seeded	No flowers; leaves somewhat purple	12
3. Russian Summer, Large Seeded	Long, slender, flowering and more leafier than 1	39
4. English Sowing Rape (1892 untrue)	Very long bare stems, flowering	36
5. Umbrella Large Seeded Rape	Close resemblance to Dwarf Essex	15
6. White Flowering Rape	Similar to Dwarf Essex, but of finer growth	12½
7. Yellow Flowering Rape	No flowers; very broad leaves	16½
8. Large Seeded Winter Rape	Resembles Dwarf Essex	17
9. Dwarf Essex	No flowers; abundance of leaves	14½
10 English Sowing Rape	Resembles Dwarf Essex	16½
11. Dwarf Hamburg, Large Seeded	Resembles Dwarf Essex	13

It will be observed from the results of this experiment that three of the varieties produced seed during the first year after sowing. The other eight were quite similar in all characteristics, each producing a good growth of leaf, and showing no signs of flowering the first year.

Rape, Different Quantities of Seed per Acre.

An experiment was conducted in duplicate in which different quantities of rape seed were sown per acre. A horse drill was used, and the seed was allowed to run from each of the eleven openings in the seed box. The amount of seed used in each instance was carefully determined. The land upon which the rape was grown was a clay loam, with a considerable amount of vegetable matter. Carrots were grown on the land in 1892. The plants were left unthinned in every instance.

Number of tube on seed drill.	Seed per acre. (lb.)	Yield of rape per acre. (tons.)
1	1.2	18.5
2	2.0	16.3
3	2.3	17.1
4	3.3	17.8
5	5.5	17.1
6	4.1	16.1
7	6.3	16.0
8	8.6	15.4
9	13.1	16.5
10	90.2	14.1
11	186.6	14.4

It will be seen from the results that the largest yield of rape per acre was produced from the thinnest seeding, which was at the rate of 1½ pounds per acre. The plants from this seeding were strong, and of a dark, thrifty appearance. Where the large amount of seed was used the plants were very fine, weak and spindling.

Rape, Yield per Acre when Grown Under Favorable Conditions.

An experiment was conducted on growing rape upon a piece of land which had received manure in the spring of the present year, and upon which no other crop was grown until it was seeded with rape, about the 1st of July. The land was low-lying, and contained a considerable amount of vegetable matter One portion of the soil possessed a perfect matting of the roots of twitch grass. The roots were partly taken from the land before the rape seed was sown. The land was ridged in the ordinary way with a double mould-board plow, and the rape was sown at the rate of about two pounds per acre, in drills 27 inches apart. The land was cultivated every week or ten days, until the rape became a good size. The yield of rape per acre when grown under favorable conditions was 27.7 tons. The rape grew very rapidly, making a complete covering to the ground. It produced a crop of over 27 tons per acre. Some of the plants were fully three feet in length. No signs of twitch grass could be found in the land after the rape was harvested, early in November. This seems a very useful, profitable and successful manner of clearing the land of such a troublesome weed as the twitch or quack.

Permanent Pasture.

The grass crop is by far the most important crop grown in Ontario. The area of cleared lands in the province in 1892 was 11,988,426 acres. The area in pasture the same year was 2,562,040 acres, or a total of 5,077,407 acres in pasture and meadow. No less than 42.35 per cent. of the cleared lands of the province was that year devoted to the growth of grasses. It is of paramount importance, therefore, that much attention should be given to the growth of grasses in the experimental field work carried on at our provincial agricultural experiment stations. And these experiments should not only relate to the introduction of new varieties, but also to the improvement of such varieties as we have, and to finding out the most suitable combination in which the various grasses and clovers may be grown in both meadows and pastures.

The term permanent pastures is much liable to be misunderstood. Strictly speaking it means a pasture that remains unbroken for a shorter or a longer term of years, or which is never plowed up at any time. As commonly used it means a pasture made by sowing certain grasses and clovers in combination, and pasturing these for a term of years of some considerable duration. It is in the sense just expressed that the term is used in this bulletin. But a permanent pasture may consist entirely or almost entirely of one kind of grass. For instance what is ordinarily termed June grass (Poapratensis) forms an excellent permanent pasture in our province even when it grows alone, or with but a slight admixture of other grasses.

Permanent pastures in this country will never probably be possessed of equal relative value with those in Great Britain and some other European countries, owing, first, to the greater coldness of our climate in winter; second, to its greater dryness in summer, and third, to the more limited duration of the pasturing season with us. But there is certainly a place for them in our rotation, and it is an important one. The coldness of our winters and the dryness of our summers will exclude many of the most valuable European forage plants from our permanent pastures, but it is probable that others may be introduced in their stead, and it is our duty to seek for these and to introduce them.

Our object in considering this subject is:

1. To give information gleaned from our experience on this Farm in reference to the question of grasses, but more especially (*a*), as to the behavior of various grasses and clovers when sown singly; (*b*) as to the behavior of various grasses and clovers when sown in certain combinations; (*c*) as to the permanency or non-permanency of certain grasses, both foreign and native, and (*d*) as to the peculiarities of some of the more important individual grasses and clovers grown on the Farm.

2. To furnish information based on our experience and also obtained from other sources: (*a*) as to the soils suitable for permanent pastures; (*b*) as to the mode of preparing the ground for these; (*c*) as to the combination in which to use them, and (*d*) as to the mode of sowing them.

Our Experience in Growing Grasses.

The following are the more important of the experiments conducted in growing grasses at this Farm, viz.:

Grasses Sown Singly.

1883	Grasses	20 varieties.
1892	"	39 "
1892	Clovers	16 "

Grasses Sown in Mixtures.

Spring, 1883	Grasses,	9	varieties	Clovers,	5
" 1884	"	8	"	"	3
" 1885	"	10	"	"	3
Fall, 1886	"	5	"	"	5

Grasses Sown Singly. The varieties enumerated in the table below were sown in plots one-twentieth of an acre in size, on May 15th, 1883. Notes were carefully taken as to their condition in 1890 and also in 1891. These notes for the two years were found to be in substantial agreement, and were published in summary in the report for 1890, p. 181. They are reproduced with some additions as follows:

Names of grasses.	Condition of grasses—Four years.	Condition of grasses—Eight years.
Meadow Foxtail	Holding well	Holding well.
Perennial Rye	A trace	All gone.
Italian Rye	A trace	All gone.
Wood Meadow	Somewhat uneven	Holding well
Rough Stalked Meadow	Somewhat irregular	Holding well.
Various-leaved Fescue	Holding well, but somewhat uneven.	Holding well, but somewhat uneven.
Sheep's Fescue	Holding well	Holding well.
Hard Fescue	Holding well	Holding well.
Fine-leaved Fescue	Holding well	Holding well.
Large-leaved Fescue	Medium quantity	Nearly gone.
Fall Fescue	Medium quantity	Medium quantity.
Red Fescue	Holding well	Holding well.
Sweet Vernal	All gone	All gone.
Crested Dogstail	All gone	All gone.
Creeping Bent	A trace	All gone.
Red Top	A trace	All gone.
Yellow Oat	All gone	All gone.
Fall Oat	Rather thin	All gone.

The same year that the grasses mentioned in the above table were sown, notes were taken of them in the autumn, which are in substance as follows: Those which had made good growth include Italian Rye, Perennial Rye, Fall Fescue and Fall Oat. Those represented as having made a slow growth include Large-leaved Fescue, Hard Fescue, Red Fescue, Sheep's Fescue, various-leaved Fescue, Meadow Foxtail, Wood Meadow, Rough Stalked Meadow, Yellow Oat and Crested Dogstail, and those spoken of as having made an intermediate growth are Five Leaved Fescue, Sweet Vernal, Creeping Bent and Red Top.

In 1892, 39 varieties of grasses were sown on May 17th in plots one one-hundredth of an acre in size. The condition of these grasses in the spring of 1893, viewed from the standpoint of hardiness and ability to make a strong and quick growth, was as follows: Bromus Ivernus, Rhode Island Bent, Yarrow, Taller Fescue and Woodside Meadow were

unusually promising. Those possessed of good, but not more than average promise, include Evergreen Meadow, Tall Oat, Yellow Oat, Timothy, English Blue, Orchard Grass, Meadow Fescue, Hard Fescue, Red Fescue, Rough Stalked Meadow, Smooth Stalked Meadow and Lathyrus Silvestris Wagneri. The Rye Grasses, viz.: the annual, Italian, and perennial varieties, made a good growth the previous season, but very few plants in any of the varieties survived the winter. Other varieties stood the winter well, but their growth was so slow, comparatively, that they are not included in the above lists.

In 1892, 16 varieties of clover were sown on May 9th in plots of one one-hundredth of an acre. Viewed from the standpoint of hardiness and the vigorous appearance of the plants, the condition of the clover in the spring of 1893 was as follows: The varieties of more than average promise include the White Dutch, the Alsike and the Welsh. But it should be remembered that these varieties do not grow so quickly, nor do they produce so large a bulk of fodder as some other clovers. Those possessed of fair promise include Perennial Red, Giant Hybrid, Broad Red Common Sanfoin, Bokhara, Lucerne and the Kidney Vetch. The latter is apparently of slow growth. The Scarlet or Crimson Clover, of which two plots were grown, was apparently all destroyed in the winter.

In the interval between 1883 and 1892 a number of varieties of grasses and clovers were sown singly, particularly of the latter, but notes regarding them would unduly enlarge this report.

Grasses Sown in Mixtures. In 1883 a mixture of grasses and clovers were sown on May 17th in a plot one-tenth of an acre in size. The names of the grasses and clovers thus sown, the quantities of seed used, and their condition at the end of five years, and also at the end of ten years, are given in the subjoined table:

Names of grasses.	Amount of seed sown per acre.	Condition of grasses, fifth year.	Condition of grasses, tenth year.
	lb.		
Timothy	7	Considerable and uniform	Medium quantity.
Orchard Grass	4	Not very prominent	Medium quantity
Italian Rye	2	None	None.
Perennial Rye	2	None	None.
Tall Oat	2	Medium and thrifty	A large quantity.
Red Top	2	Only a trace	None.
Meadow Fescue	3	Considerable, and holding its own well	Medium quantity.
Creeping Bent	1	A trace	None.
Kentucky Blue	2	Considerable	A trace.
Lucerne	4	Plants over the plot	A fair amount.
White Clover	3	A trace	None.
Alsike Clover	1	More than of any other clover	Nearly gone.
Red Clover	1	Very little	A good quantity.
Yellow Clover	1	A trace	Medium quantity.

These grasses were not pastured, but were simply mown once a year and rather late in the season. The experiment, therefore, was a test of the survival of the fittest among the grasses sown, rather than an experiment to determine their value in a permanent pasture. It will be observed that the grasses were sown at the rate of 25 lb. per acre, and the clover at the rate of 10 lb.

In 1884, one acre was sown with a mixture containing eight varieties of grass and three of clover. The fourth season after sowing, a careful examination brought out the facts stated below. It was found that the grasses which had best maintained their hold were Meadow Fescue, Canadian Blue, Timothy, Orchard Grass and Red Top, in the order named. Only a trace of Italian Rye and Perennial Rye could be found, and but a small quantity each of Tall Oat Grass and of Red Clover remained. This plot had been closely pastured each year except the first.

In 1885, four acres were sown with grasses intended for permanent pasture. Of these two acres were broken up in the autumn of 1890. The other two acres remain.

This plot was closely eaten off every year prior to the winter of 1890, except the year in which it was sown. The names of the grasses and clovers sown, the quantities of seed used, and their condition at the end of eight years, are given in the table below :

Names of grasses.	Amount of seed sown per acre.	Condition of grasses, eighth year.
	lb.	
Timothy	1	A small quantity.
Orchard Grass	2	The second leading grass as to quantity
Red Top	1	All gone.
Tall Oat	3	An average quantity.
Italian Rye	1	All gone.
Perennial Rye	1	All gone.
Meadow Fescue	2	The leading grass as to quantity.
Meadow Foxtail	1	The third leading grass as to quantity.
Canadian Blue	1	A trace.
Hard Fescue	2	More than a trace.
Red Clover	2	Less than an average quantity.
White Clover	2	A trace.
Alsike Clover	3	A large quantity.

It will be observed that the grasses in the mixture given in the above table were sown at the rate of 15 lb. per acre, and the clovers at the rate of 7 lb. The part still unbroken has been divided into a number of plots, and various experiments are now being conducted with these, with a view to their renovation.

In the autumn of 1886 a plot of mixed grasses were sown on September 16th. It contained one-tenth of an acre, and the whole mixture was sown at the rate of 35 lb. per acre. The chief object of this experiment was to determine the suitability of the autumn for sowing grasses found useful as permanent pastures when sown in the spring. The quantities of seed used, the names of the grasses sown, and their condition at the end of one year and six years respectively, are given in the following table :

Names of grasses.	Condition of grasses—One year.	Condition of grasses—Six years.
Meadow Fescue	Considerable, and doing well	A fair amount.
Meadow Foxtail	Equal in quantity to above	A large quantity.
Perennial Rye	Some only at outer edges of plot	None.
Yellow Oat	A very few plants	A large quantity.
Timothy	Nearly as much as of Meadow Foxtail	A goodly quantity.
Lucerne	Not very much	A fair amount.
Alsike Clover	Not very much	A fair amount.
Common Red Clover	Not very much	A trace.
Yellow Clover	Only a trace	A large quantity.
White Clover	Only a trace	None.

The above plot was mowed once every year and somewhat late in the season. A field containing twenty acres was sown for permanent pasture in the spring of 1882. A mixture of grasses and clovers was used. We have not been able to ascertain the exact nature of the mixture or the quantities of seed used. They were sown with a crop of oats. The field was mowed for two years, but since that time it has been pastured every year. It still yields a large amount of pasture, certainly more than can be obtained from an ordinary Canadian Blue grass pasture, and more than is usually furnished by common red clover and timothy of the second and third year's growth respectively. But it should be mentioned here that the soil is well adapted to growing grasses. It is principally composed of clay loam, and contains a large amount of vegetable mould. It has not

been renovated in any way since it was sown. The more prominent grasses in this field now are Canadian Blue, Orchard grass, Timothy and White Clover. Of Canadian Blue grass and White Clover there is relatively a large amount, and also a fair amount of Orchard grass. A number of other grasses still linger, but they are not now greatly prominent.

This experiment, and also some or the others previously mentioned, are probably the oldest, if not indeed the oldest that have been conducted in Canada in growing mixed grasses and clovers with a view to test their permanency. Owing to the limited period therefore during which many of them have been grown, we feel that special care should be exercised in drawing definite conclusions in regard to them.

Permanency of certain Grasses. In the aforementioned tests the following grasses, when sown in mixtures, have proved the most permanent amongst the kinds possessed of the highest value as fodder plants, and probably in the order mentioned, viz.: Meadow Fescue, Orchard grass, Meadow Foxtail, Tall Oat and Timothy. Those of less importance include Hard Fescue, Red Fescue, Wood Meadow, Rough Stalked Meadow, Sheep's Fescue, Various-leaved Fescue, Fine-leaved Fescue, Tall Fescue and Long-leaved Fescue, and these probably possess permanency in the order named. Some of these in the list last mentioned have even greater power to endure than those in the list first mentioned.

The varieties which in our experience have not shown much permanence are Italian Rye, Sweet Vernal, Crested Dogstail, Tall Oat, Perennial Rye, Creeping Bent and Red Top, and they have been found wanting in permanency in the order named

In the tests conducted at this Farm the clovers have been found durable in the following order, viz.: Lucerne, Alsike clover, Yellow clover, White clover and Common Red clover. Yellow clover, like White clover, does not seem able to hold its ground at the first in dense mixed grasses which are cut for hay, but as time goes on and some of the grasses fail, the Yellow clover appears to increase. When White clover is sown in mixtures of permanent grasses, and these are mowed for some years at the first rather than pastured, the clover seems to fail because of the smothering influence exerted by the stronger grasses: but where the grasses are pastured from the first, it seems to have power to increase with the increasing age of the pastures. Red clover is not well adapted for permanent pastures, as ordinarily it is a biennial, and therefore soon dies out. When found in these pastures after they have been eaten off for two years, the plants come from seed lying in the ground.

Peculiarities of Growth. Brief notes are now given regarding peculiarities of growth in some of the grasses which are not commonly grown in Canada by many of the farmers.

Orchard grass (*Dactylis glomerata*) grows both early and late in the season. It comes into head early in June, and if not cut while yet succulent it soon becomes so woody that it is of but little use for hay. It is a strong, vigorous grower and is coarse in the leaf, hence it should be eaten off while young and tender. It has the habit of growing in tufts or bunches, but when sown thickly at first it makes a good grass for a permanent pasture.

Meadow Fescue (*Festuca pratensis*) is a persistent grower. It is later than orchard grass and is much finer in the leaf and stalk. Its long fibrous roots enable it to stand drouth well, and it is able to retain its hold upon the soil for a long time. It is one of the most valuable grasses that can be sown in a permanent pasture.

Tall Oat Grass, (*Arena elatior*) is a hardy perennial which bears considerable resemblance to the common oat. It is easily established, grows early and late and produces a large amount of pasture. It is somewhat bitter to the taste; notwithstanding, live stock eat it fairly well.

Meadow Foxtail, (*Alopecurus pratensis*) is a perennial which bears considerable resemblance to Timothy, but is softer in the head and springs up more quickly when pastured or mown. It is one of the earliest of grasses, as it comes into flower towards the end of May. Although hardy it is somewhat slow in becoming established.

Lucerne or Alfalfa, (*Medicago sativa*) is an upright growing and deeply rooting plant of the same family as the clovers. It grows most vigorously in loam soils with a deep, dry porous sub-soil. It is a delicate plant when young, and it is then easily crowded

out by other strong-growing plants, but when it has once become established it will continue to grow vigorously for years, and it furnishes pasture throughout the season, but should not be cropped too closely. There is a much wider place for Lucerne in Ontario than has hitherto been given to it, more especially in light soils on which the vegetation is liable to suffer from drouth.

Alsike Clover, (*Trifolium hybridum*) is one of the most suitable clovers for growing in permanent pastures It is best adapted to moist loam soils and is not easily crowded out by other grasses. It produces fine leafy herbage, but does not provide much pasture latter than midsummer.

Red Top, (*Agrostis vulgaris*) is probably somewhat finer in its habit of growth than timothy, and like the latter it is somewhat late in coming into head. It has been recommended for sowing in moist soils, and has been represented as possessed of great powers of endurance, a reputation which has not been sustained in our experience with it on this Farm.

Yellow Oat Grass (*Trisentum flavescens*) is very fine and leafy in its habit of growth and should therefore make a pasture much relished by stock, but in our experience it cannot be said to have proved really enduring.

Lathyrus Sylvestris Wagneri, the new fodder plant about which much has been said in Europe during recent years, is growing fairly well. In its habit of growth it resembles in appearance the sweet pea of the flower garden. The lower stalks or vines branch out in every direction and are to some extent recumbent at the first rather than upright. It is premature to speak of the value of this fodder plant, but it does not seem to grow quickly enough to give it a foremost place among fodder plants in this country where the summers are relatively short.

Some other grasses sown at this Farm for the first time in 1892, seem possessed of no little promise. Among these may be mentioned Woodside Meadow and Bromus Ivernus The former was 16 inches nigh on June 5th, and the latter 12 inches. Bromus Ivernus has broad leaves and is a vigorous grower. But it may be found that it will prove so aggressive as to give some trouble in eradicating it in certain soils.

Among the Fescues, Tall or Fescue is possessed of no little value. On June 5th it was quite out in head, and was from 20 to 30 inches high. The Fescues, generally speaking, seem well able to stand the cold of our winters, but they are nearly all possessed of slow habits of growth.

The rye grasses in our experience have not proved sufficiently hardy to warrant us in recommending them for sowing in permanent pastures. In no instance have we found them enduring, and this remark applies to the three varieties tested here, viz.—the annual, perennial and Italian.

Scarlet or Crimson Clover (*Trifolium incarnatum*) is lacking in hardiness. During the trials given to it in 1891 and 1892, very few of the plants survived the cold of the winters following.

Past Experiments with Permanent Pasture. The information given in reference to permanent pasture is based principally on our experience with them on this Farm. The materials to be gathered from other sources are limited as yet, but what little has been gleaned is embodied in our remarks, without special reference thereto. Several farmers in Ontario laid down permanent pastures some years ago. In nearly all of these considerable prominence was given to some of the non-enduring rye grasses and the slow-growing Fescues, and disappointment followed. The large quantities of seed sown made the experiments expensive. The expense of their early tests linked with the disappointment from lack of suitability in some of the grasses created a prejudice against the whole question which judicious demonstration alone can overcome, and not until considerable time shall have elapsed. But as has been shown, some grasses have been found well adapted to the uses of permanent pasture and others will doubtless be found to add to them as the years go by.

Adaptability of Soils. Good, rich, easily tillable soils are the most suitable for grow-

ing mixed permanent grasses. They should be porous, friable and moist, plentifully supplied with humus and well drained, naturally or artificially. Those well adapted to the growth of a heavy crop of Indian corn will also usually be found well adapted to the growth of permanent pastures.

Soils that are not well adapted to the growth of the more common grasses will certainly prove ill-adapted to the growth of permanent pastures. This means that soils unduly dry or unduly moist will not be suitable. The former will not sustain vigorous growth, and in the latter the superior grasses cannot live, and it means that soils very light or very heavy will also be unsuitable. In the former plant food is lacking, and in the latter the roots cannot ramify sufficiently. Rugged uplands, undrained levels, shallow soils, overlying rock, blow sand areas, impenetrable clays and undrained marsh and fen lands should all be excluded in laying down lands to permanent pastures composed of a number of grasses

Preparing the Soil. In preparing land for permanent pastures clean tillage and thorough pulverization are the most important essentials. Soils not rich in plant food should be made so, and the food thus supplied should be in a readily available form, so that the young plants be given a vigorous start. If fresh farm-yard manure is the fertilizer applied, it may be well in many instances to apply it with the preceding crop.

Clean tillage is especially important, as, if permanent grasses are sown in fields foul with weeds, the latter materially injure the grasses through crowding and in other ways, before they become well established, and with many forms of weeds the tendency will be to increase rather than decrease. This is especially true of some forms of creeping perennials.

Thorough pulverization is necessary to facilitate the covering of the seeds evenly and uniformly, to exclude the undue access of air and light, to prevent the too rapid escape of moisture, and to afford a foraging ground easily penetrated by the rootlets of the young plants.

Mixture of Permanent Grasses. The most suitable mixture of grasses for a permanent pasture and the respective quantities of each that may be sown, will of necessity vary somewhat with variations in soil and climatic conditions. In the present state of our knowledge it would manifestly be unwise to submit any formula for making these pastures in the belief that it could not be improved upon. We submit the following formula, therefore, in the hope that it may be found useful as a general guide to those who are laying down permanent pastures, and who may at the same time be in some doubt as to the grasses most suitable for them :

Grasses.

	Per acre.
Orchard grass	4 lb.
Meadow Fescue	4 "
Tall Oat Grass	3 "
Timothy	2 "
Meadow Foxtail	2 "
Total, Grasses	15 lb.

Clovers.

Lucerne	5 lb.
Alsike	2 "
White or Dutch	1 "
Yellow or Trefoil	1 "
Total Clovers	9 lb.
Total Grasses and Clovers	24 "

The varieties named and the quantities of seed given in the above formula are based upon our experience at this Farm. In soils possessed of different characteristics, some modification in the varieties would be necessary, and also in the relative amounts of seed to be sown. Future experiments will probably add other varieties to the list. And along with such additions a still further change in the relative amounts of seed of the varieties mentioned may be found necessary. Indeed it is more than probable that it shall be so.

Kentucky Blue grass is not included in the above list, since the Canadian Blue grass which is very similar, appears to be indigenous to our soil, and will therefore soon come in of itself in sufficient quantities. But no real objection can be offered to sowing it other than that mentioned, unless it be the difficulty frequently complained of in procuring good and pure seed. Nor is Red Top included, although it is in favor with some seedsmen in preparing mixtures for permanent pastures, and the experience of some of those who have tried it is decidedly in its favor. But in tests at this Farm as previously mentioned, it has not shown so much permanency as several other grasses.

Mode of Sowing. The statement has frequently been made that lands should be summer-fallowed when being prepared for permanent pastures. This plan, though a good one under some circumstances, is by no means a necessity. Any mode of preparation will suffice that will thoroughly clean the land, and this can oftentimes be accomplished by simply growing a hoed crop, but it should be one that would not leave any roots in the soil that would serve as obstacles to the implements of cultivation, as for instance corn. In the spring, as soon as the land is dry enough, thorough and fairly deep surface cultivation should be given. About one bushel of barley per acre may then be sown with the grain drill. The clover seeds and the smaller of the grass seeds after they have been mixed may be sown at the same time and by the same implement. They should fall behind the drill tubes. The larger grass seeds may then be sown by hand, but only when the air is still, owing to the lightness of some of them. The roller may then follow, but in some instances it may be advisable to use a light harrow in advance of the roller. The light seeding of barley furnishes the requisite amount of shade, and it does not smother the plants by its thick growth. Sometimes grasses for permanent pastures are sown alone, but there does not seem any necessity for this when a thin seeding of barley is the surest crop used.

Conclusions.

1. That there is a place for permanent pastures in the agriculture of Ontario, and that this place is one of much importance relatively.

2. That many of the grasses found suitable for permanent pastures in Britain are not suitable for the same in Ontario, owing to the greater coldness of our winters and greater dryness of our summers.

3. That among the foreign grasses hitherto tested at this station, Orchard Grass, Meadow Fescue, Tall Oat Grass, and Meadow Foxtail have been found the most enduring among the more valuable grasses.

4. That the autumn is not so suitable as the spring for sowing permanent pastures.

5. That as Canadian Blue grass appears to be indigenous to the soil, there does not appear to be any great necessity for sowing it when laying down permanent pastures.

6. That in sowing permanent pastures a crop of barley may as well be grown at the time if sown thinly.

LIVE STOCK EXPERIMENTS.

These included experiments with 170 animals conducted during the year as follows :
Steers, two experiments, six animals.
Cows, one experiment, four animals.
Lambs, three experiments, one hundred and sixty animals.
The food in all these experiments was carefully weighed, and the details of each test were carefully recorded throughout.

Corn Ensilage and Straw for Making Beef.

For three years in succession ending with the spring of 1892, experiments had been carried on at this Farm to test the value of corn ensilage and meal for making beef when fed as the sole ration. The results were not in every way satisfactory. In Bulletin LXXXII, p. 7, Conclusion 4, where deductions are drawn from three experiments, the following language is used : "From the behavior of the animals fed ensilage and meal we do not consider this ration a perfectly safe one for furnishing live stock in beef-making, as out of the six animals fed upon it two died and three were occasionally off their food." After the experience just referred to, the question naturally arose as to whether in feeding for beef some other mode or modes for using so valuable a food factor could not be adopted in which the elements of danger would be entirely absent. In the hope of throwing some light on the subject the experiment was undertaken, the details of which are given below.

The chief object of the experiment therefore was to acertain the value of straw as a food factor in making beef when fed along with corn ensilage and meal, (a) with referance to its influence on the health of the animals, and (b) when viewed from the stand-point of economy. But the following objects were also kept prominently in view, viz—(1) Using a cheap ration, and (2) feeding less meal than is usually given along with corn ensilage when feeding for beef.

The Animals Selected. Shorthorn grades were chosen for the experiment. Of the six animals used five were two years old and the sixth was one year older. They were of rather small build and could scarcely be said to possess the most desirable characteristics for highly successful feeding. They were purchased by the farm foreman on Nov. 14th. 1892.

Period of Preparation. From Nov. 14th to Nov. 21st, they were fed on a uniform ration. On Nov. 21st they were given a ration the same in kind as that intended to be used in the experiment. It consisted of a mixture of corn ensilage and straw in the proportions of three of the former and one of the latter. The meal used was composed of equal parts by weight of ground oats, ground barley and ground peas. The object sought was to accustom the animals to the ration before commencing the experiment proper.

Food and Feeding. The experiment proper commenced Dec. 1st, 1892, and ended May 30th, 1893, thus covering a period of 180 days. During the first and second periods of the experiment, which are stated more fully below, the animals were given all the straw and ensilage they would eat up clean and in the proportions named above, but during the third period hay was substituted for straw. Oat straw was the only kind used. The meal, straw and ensilage were mixed just before being fed, and three feeds per day were given. In thus mixing the feed three objects were kept prominently in view : The first was to so distribute the meal that the animals would be induced to eat more of the mixture ; the damp ensilage caused the meal to adhere to it so that the distribution was thus easily affected. The second was to secure a more perfect digestion of the meal given through a more perfect rumination ; and the third was to so intermix the straw with the ensilage that it would act as a corrective to any tendency toward indigestion that might be caused by feeding a large quantity of ensilage. The meal ration was increased with each successive period.

Food Ratio. The following amounts of food were consumed by the six animals during each period, and also daily by each individual animal.

The proportion of the straw fed may appear small, but it should be noticed here notwithstanding, that it contained as much dry matter as about thirty-six lb. of corn ensilage, so that to have given each animal daily in the form of ensilage alone as much dry matter as was actually fed in the ensilage and hay or straw given, would have required a daily consumption per head of 61.7 lb ensilage.

Period.	Amount of food consumed				Average daily amount of food consumed per animal.			
	Meal.	Corn ensilage.	Dry fodder.		Meal.	Corn ensilage.	Dry fodder.	
			Straw.	Hay.			Straw.	Hay.
	lb.	lb.	lb.	lb.	lb	lb.	lb.	lb.
First 60 days	1153	9381	3127	....	3.2	26.1	8.7	.....
Second 60 days ..	2386	9240	3080	.....	6.6	25.7	8 6	....
Third 60 days ...	3054	8880	.....	2960	8.5	24.7	.....	8.2

The average amount of food used per animal per day throughout the whole experiment of 180 days was: meal 6.1 lb, ensilage 25.5 lb, and dry fodder 8.5 lb In the experiment of 1891-2, the average amount of meal fed to the animals which were given ensilage only in addition was 9.64 lb per head per day, and the ensilage given them was 53.5 lb. The meal ration thus given was 3.54 lb per head per day less in this experiment than in the one of the previous year, and it is possible, if not probable, that the amount of meal used might have been still further reduced during the later stages of the experiment with positive advantage. The size of the animals, however, was somewhat greater in the experiment of 1892 than in that of 1893.

It may be well to mention here, that the six animals were divded into three groups of two each, and different quantities of the meal ration were given to them in every instance and with varying results, but we feel that it would be premature to draw conclusions from these without further experiment.

The Health of the Animals. The health of all the animals was uniformly good throughout the experiment, and this is the more note-worthy since, in the three preceding experiments, the animals fed ensilage and meal only, were troubled with occasional periods of indigestion. to say nothing of the losses incurred by death. These periods were sometimes so prolonged that a temporary change of diet was found necessary to restore the equilibrium.

Weights of the Animals. The animals were weighed at the commencement of the experiment and at the commencement of each period thereafter. The weights in every instance represent the averages obtained from weighing on two consecutive days. The weighing was always done at the same hour of the day.

— —	Period I. (60 days.)	Period II. (60 days.)	Period III. (60 days.)
	lb.	lb.	lb.
Weight at commencement of the experiment.	6249.00	6995.00	7627.00
Weight at close of the experiment	6995.00	7627.00	8189.00
Increase in live weight	746.00	632 00	562.00
Individual increase	124.33	105.33	93.66
Individual daily increase.	2.07	1.76	1.56

It will be observed that the average gain per day in the first period was 2.07 lb, in the second period 1.76 lb, and in the third period only 1.56 lb. These facts are the more note-worthy when we reflect that the meal ration was materially increased in each successive period. They would seem to indicate that an unnecessarily large amount of meal was used in the second and third periods The excellent results obtained from feeding the light meal ration during the first period may in part be accounted for by the amount of grain in the ensilage, and this fact should certainly receive careful attention from those who use corn ensilage freely in beef-making. In this experiment only the best varieties of corn were used for ensilage.

Estimated Value of the Food. The meal, the straw, and the hay were estimated at the current market values in Guelph, less the cost of marketing from an Ontario farm under average conditions. The home value put upon the oats therefore was 24½ cents, per bushel, barley 38 cents, peas 57 cents, cut straw $2 per ton, and cut hay $6.50. Corn ensilage was valued at $1.75 per ton. The grinding was put at six cents. per 100 lb.

The average cost of the daily ration given during the first period was 6.41 cents, during the second period, 9.35 cents, and during the third period, 12.31 cents. For the whole period of 180 days it was 9.36 cents. In the experiments extending from 1889 to 1892, to which reference has already been made, and in conducting which a heavy meal ration was fed, the average cost per day was 17.59 cents. The average cost of the daily ration, therefore, in this experiment, was 8.32 cents less per day than in the experiments just referred to. The average increase of live weight made per day by the animals in this experiment was 1.80 lb., while in the former it was but 1.75 lb. The difference in the results cannot be attributed to a decrease in the market values of the food rations used, for these were, all things considered, but very slightly different. It is rather to be sought for in the freer use of the cheaper food factors.

In this experiment, the cost of the food required to produce one pound of increase in the live weight during the first period was 3.09 cents, during the second period, 5.31 cents, and during the third period, 7.89 cents. The average for the whole period of 180 days was 5.43 cents. In the three experiments previously conducted since 1889, the average cost for food to produce one pound of increase in live weight was 10.05 cents.

These findings are certainly suggestive, and they emphasize, first, the importance of feeding cheap food factors in making beef when these can be obtained, and, second, the most careful oversight of the quantities of meal to be given, as this is always the most costly of the food factors used.

It will be noticed that while the cost of the food required to produce one pound of increase in the live weight went up from 3.09 cents in the first period to 7.90 cents in the third period, an increase of more than 100 per cent., the increase in the live weight was also greater on the cheaper ration, as during the first period it was 2.07 lb. per day, and during the third period but 1.56 lb. The inference, therefore, is just which would claim that had the less costly ration been more nearly adhered to until the approach of the close of the experiment, the results would have proved even more satisfactory. But we must not overlook the fact that usually somewhat greater gains are obtained in proportion to the food used during the earlier stages of the fattening period, as against the later stages.

It is also worthy of notice that the average cost of food required to produce one pound of increase in the live weight throughout the experiment was 5.43 cents, while the price obtained for the same was 5.25 cents. It is just possible that in the records of live stock experiments in this country, which relate to the fattening of cattle, the above is the nearest approach that has yet been made between the price obtained per pound for the increase in live weight and the cost of the food used in making it.

Financial Summary.

Cost of animals at commencement of test	$200 54
Cost of food	101 01
Cost of attendance	22 50
Total cost	$324 05
Value of animals at close of test	$418 00
Profit (not including manure)	93 95

At the commencement of the experiment the animals were valued at 3⅜ cents per pound, live weight, as 16 days previously they had been bought for 3¼ cents per pound, live weight. They were sold for export to Mr. L. O. Barber for 5¼ cents per pound, live weight, at the close of the experiment, but for reasons which relate solely to the purchaser, they were not taken away by him until about four weeks thereafter. Fasted weights were used, and the average shrinkage during a fast of 15 hours was 37.8 lb. per head. The cost of attendance was based on the assumption that one person, at $25 per month, would feed and care for 40 head under ordinary conditions. This was the estimate used in the more recent of the previously conducted feeding experiments.

While the profit in the transaction during the continuance of the experiment was $93.95, without including the manure, if we take the same into the account, the profit would be $142.55. In obtaining these figures, the manure was valued at $1.50 per ton, as in the experiments of the preceding years, and the value of the bedding used was deducted therefrom.

Conclusions.

1. In fattening cattle on a ration of which ensilage made from sufficiently matured corn forms a leading factor, a heavy grain allowance in addition does not seem necessary.

2. While in this experiment, the daily cost of the food ration was 8.32 cents less per animal than the average in the three experiments in fattening cattle which preceded it, the average daily increase in weight was somewhat more.

3. In this experiment the difference in the value per pound, live weight, between store animals and the same when finished was 1⅞ cents per pound.

4. The average shrinkage from a fast of 15 hours, with liberty in the yard, in prime animals of equal weights with those in the experiment, is about 38 pounds per head.

5. In beef making, a ration composed of 1 part oat straw, 3 parts corn ensilage and a moderate allowance of meal, seems well calculated to maintain uniformly good health in the animals fed upon it.

6. In making beef during the finishing period, when the prices of the food factors used and those obtained for the beef are the same as in the experiment, it is possible to get nearly or quite value for the food used in making the increase in the live weight, to say nothing of the advance in value on the original weight of the animals.

An Experiment to Determine the Amount of Manure Made by a Cattle Beast During the Successive Periods of its Growth.

On the 16th of October 1890, an experiment was commenced to determine the amount of manure which would be produced by a cattle beast during the different stages of growth up to three years of age.

A calf was placed on the experiment from the time of birth and when about three days old was placed in a box stall in a warm stable. The box stall was about 12 feet square and the walls reached to about 5 feet in height. The stall which extends above the walls opens into the the large cattle stable. It possesses a cement floor and a closely made feeding trough. The animal was allowed exercise once a week by leading by the halter in the open air from five to ten minutes. All bedding was carefully weighed when placed in the stall and the manure which was removed weekly was carefully weighed at each time of removal. The various food factors as well as the water were

weighed when given to the animal. That amount of food was allowed which the animal would eat up cleanly. Salt was given twice each week.

Food Eaten. Milk was given from the pail during the first six months of the animal's life. Oil cake was given in a limited quantity during the first two months after birth. Roots, ensilage or green fodder was given to the animal during the whole of the experiment and hay, oats, peas and bran were fed throughout the 3 years with the exception of the first month. The following table gives the amount of food consumed during each six months of the experiment and the total amount consumed during the three years :

	Amount of liquids consumed.		Amount of concentrated food consumed.				Amount of coarse food consumed.		
	Milk.	Water.	Oats.	Peas.	Bran.	Oil-cake.	Hay.	Fodder.	Roots.
	lb.	lb.	lb	lb.	lb.	lb.	lb.	lb.	lb.
First six months....	3861.5	501.5	62.10	31.05	31.05	31.05	146.0	.....	292 0
Second six months..	.....	9241.5	363.32	266.52	266.52	198.64	1307.0	1591.0	581.0
Third " ..	.....	6141.0	361.35	361.35	361.35	.....	1561.0	.....	4145.0
Fourth " ..	.....	9480.0	369 01	369 01	369.01	.....	1982 0	2989 0	1672 0
Fifth " ..	.....	7900.0	381.33	381.33	381 33	.....	1295.0	4168.0	.....
Sixth " ..	.....	9185.0	424.00	424.00	424.00	.....	1425.0	4493.0	580.0
Whole period of years	3861.5	42449.0	1961.11	1833.26	1833.26	229.69	7716.0	13241.0	7270.0

Estimated Value of the Food. The fodder, grain and roots were estimated at the current market values in Guelph less the cost of marketing from an Ontario farm under average conditions. The home value put upon hay, therefore, when cut, was $6.50 per ton, green fodder $2.00 per ton, the ensilage $1.75 per ton, the oats 24½ cents per bushel, peas 57 cents per bushel, barley 38 cents per bushel, wheat 60 cents per bushel, the roots when sliced 6 cents per bushel, and the bran and oil-cake reckoned as delivered at the average Ontario farm were put at $13.00 and $22.66⅔ per ton respectively. The following table gives the daily cost of the food, the daily increase in live weight and the average cost of producing 100 lb. of live weight increase.

	Cost of food per day.	Increase in live weight per day.	Cost of producing 100 pounds live weight increase.
	cents.	lb.	$ c.
First six months	9.8	2.40	4.09
Second six months	8.6	1.89	4.56
Third "	9.8	1.25	7.83
Fourth "	10.9	1.25	8.68
Fifth "	9.5	.96	9.90
Sixth "	10.6	.96	11.17
Average (three years)	9.9	1.45	7.71

From this table it will be observed that the greatest cost of food took place during the last half of the animal's life, although there is but little difference in the average cost of food per day during any part of the 3 years in which the animal was under experiment.

There is however a marked difference in the increase in live weight of the animal as an average of 2.4 lb. per day live weight increase was produced during the first six months of the animal's life and less than 1 lb per day was produced when the animal was between 2½ and 3 years old. The increase in the live weight becomes less as the animal advances in age.

The cost of producing 100 lb. live weight was lowest when the animal was young and gradually increased with each six months that the animal was fed, the greatest cost to produce 100 lb. being the last six months that the animal was under experiment.

Amount of Manure Produced. The following table gives the amount of manure produced by the animal during each period of the experiment.

	Amount of straw used as bedding.	Total amount of manure produced	Amount of manure produced, less the straw.
	tons.	tons.	tons.
First six months	.43	1.95	1.53
Second six months	1.01	5.00	3.99
Third "	1.17	5.16	3.99
Fourth "	1.35	6.08	4.73
Fifth "	1.22	5.77	4.55
Sixth "	1.20	5.68	4.49
Whole period (three years)	6.38	29.64	23.28

On December, 23rd, 1892, Prof. Shuttleworth made a careful analysis of the manure which was from the stall but a short time previously. The analysis represents the average of two determinations which were substantial agreements. The analysis is as follows:

	Per cent.
Water	53.51
Nitrogen	.634
Phosphoric acid	.829
Potash (K_2O)	1.944

These results speak of high quality in the manure. This is what we should look for from a grain-fed beast kept in a box stall. Prof. Shuttleworth gave the following statement in regard to the value of the different constituents:

Organic nitrogen	17 cents per lb.
Phosphoric acid	3 cents per lb.
Muriate of potash	4½ cents per lb.

Reckoning the value of the manure from the analysis made in December, 1892, from the basis of the value given for commercial fertilizers, the value of the manure produced by the steer under experiment for three years would amount to $118.57. The straw used as bedding valued at $1.50 per ton would make a total cost of $9.56. The most important point in connection with this experiment is, however, the quantity of manure produced by the cattle beast, during the different periods of its life. Each person can place such value upon the manure as he deems proper. $1.00 to $1.50 per ton is the amount which is usually considered when estimating the value of the farm-yard manure.

Ground Wheat as a Food Factor for Milch Cows.

This experiment commenced on February 23rd, 1893, and closed on June 22nd, 1893, thus covering a period of 120 days. The objects of this experiment were as follows: (1) to determine the influence of ground wheat upon the flow of milk when fed to milch cows; (2) to determine the relative cost of feeding ground wheat compared with mixture of ground peas, barley, and oats for milk production. Owing to the low price of wheat at the present time, many queries are made as to the advisability of using it as a stock food. In regard to this point there is a great diversity of opinion. Some people very strongly advise the use of wheat as a food for dairy stock while others as strongly condemn the practice as being too expensive. There is certainly a possibility that wheat will command a higher price in the near future than it does at the present time.

The Animals Selected. In this experiment 4 animals were used; 3 of which were purchased for the farm by Mr. J. E. Story a short time before the test commenced. Two of the cows were Shorthorn grades, one had a touch of Jersey blood and the other partook slightly of the Ayrshire breed. All the cows had dropped their calves at least a month prior to the experiment.

Period of Preparation. For 10 days previous to the commencement of the experiment, the cows were all fed the same kind of feed and the treatment of the different animals was the same. At the close of preparation they were divided into two groups, with two animals in each. Each group was tied in a double stall and the experiment proper commenced on February 23rd.

Food and Feeding. The cows in group one were fed hay, straw and ensilage throughout the experiment of 120 days and in addition were fed ground oats, ground peas and ground barley in the proportion of 2, 1 and 1 by weight during the first 60 days, and ground wheat during the second 60 days. The cows in group two were fed the same kind of feed as those in group one with the exception that the ground wheat was fed during the first 60 days and the mixed meal during the last half of the experiment. The hay and the straw were fed together in equal proportions after being cut. The ensilage was of good quality and was made purely from corn. Water was given twice daily and salt twice weekly.

Amount of Food Consumed by the Four Animals Throughout the Experiment.

	First 60 days.					Second 60 days.				
	Hay.	Straw.	Ensilage.	Mixed meal.	Ground wheat.	Hay.	Straw.	Ensilage.	Mixed meal.	Ground wheat.
	lb.	lb.	lb.	lb.	b.	lb.	lb.	lb.	lb.	lb.
Group I.	625	625	4544	1070	.....	572	572	4382	.....	1080
Group II	624	624	3223	.....	1055	592	592	3818	1080	.....

Estimated Value of the Food. The hay, straw and grain were estimated at the current market values in Guelph, less cost of marketing from an Ontario farm under average conditions. The home value put upon the hay, therefore, when cut was $6.50 per ton, straw $2.00 per ton, ensilage $1.75 per ton, oats 24½c per bushel, peas 57c per bushel, barley 38c per bushel and the wheat 60c per bushel.

Weights of the Animals. Each cow was carefully weighed at the commencement of the experiment, at the end of the first 60 days, and at the close of the experiment. Weighing was commenced at 2 p.m. in every instance and the cows were weighed in the same order at each weighing.

The following shows the amount of increase in live weight of each group during each period of the experiment :

Group I. Increase in live weight during the first 60 days when fed a mixed meal ration, 27 lb.

Group II. Increase in live weight during the second 60 days when fed a mixed meal ration, 50 lb.

Group II. Increase in live weight during the first 60 days when fed a wheat ration, 5 lb.

Group I. Increase in live weight during the second 60 days when fed a wheat ration, 15 lb.

It will be observed from this table that there was an increase in live weight during the entire experiment, as follows :

Animals receiving mixed meal ration ..... 77 lb.
Animals receiving ground wheat ration ..... 20 lb.

Milk Production. The milking took place at 5.30 a.m. and 5 p.m. daily. The milking was done by the same person throughout, and the milk was carefully weighed

during the entire experiment. The following statement shows the quantity of milk produced by each group during each period of the experiment :

Group I. First 60 days mixed meal ration..... 3,555½ lb. of milk.
Group II. Second 60 days mixed meal ration.... 2,865½ lb of milk.
Group II. First 60 days ground wheat ration .... 2,890½ lb. of milk.
Group I. Second 60 days ground wheat ration.... 2,892 lb. of milk.

This seems to indicate that the mixed meal ration kept up the flow of milk better than the ration of ground wheat. It will be observed that the following total amounts of milk were obtained from the different rations during the entire experiment :

Animals receiving mixed meal ration ..... 6,421 lb.
Animals receiving ground wheat ration ..... 5,782½ lb.

This shows that the mixed grain ration produced 638½ lb. of milk more than was produced by the ration of ground wheat.

Cost of producing 100 lb. of Milk. When the cost of food of each ration is reckoned up according to the estimated value of the food given in the earlier part of the report of this experiment, it is found that the ration which contained the mixed meal produced 100 lb. of milk at a cost of 46 cents for the food consumed ; and that the ration which contained the ground wheat produced 100 lb. of milk at a cost of 57 cents for the food consumed. It will also be remembered that the ration containing the mixed meal produced nearly four times as much live weight increase of the animal as did the ration containing the ground wheat.

Feeding Lambs on Rape.

Sixty grade lambs were placed upon an acre of rape on the 18th September, 1893. They had the crop eaten and were changed to another portion of the field on October 11th. This shows that 60 lambs were pastured upon an acre of rape for a period of 23 days. It has been found in the past that an acre of rape would pasture on an average about 10 lambs for 2½ months. In the instance in which this was done, however, the rape was the second crop of the land during the same season. In the experiment of the present year it, however, produced about double the amount of rape which is usually produced. This was the only crop this season on the land. The lambs did well when pastured on the rape during the present year.

Experiment on Feeding Lambs on Different Rations.

This experiment is quite similar to one carried on in 1892, in which three groups of lambs were fed different rations. The experiment of the present year, however, relates to the feeding of four groups on different rations. It may be fitly designated as an experiment within an experiment. The lambs used in conducting it were at the same time being fattened for the British market. The experiment treats of 96 lambs which were divided into four groups with 24 animals in each group. On December, 29th, 1892, they were all weighed and the test commenced the following day. It closed April 28th, thus covering a period of 120 days. The leading object of this stock experiment was to ascertain the respective values of the various rations used for fattening lambs.

Conditions Governing the Experiment. The 96 lambs were so divided that those in each of the four groups were nearly equal in quality. They were then put into four equal-sized compartments of the same closed shed, the internal divisions of which were made by feeding racks running across the building. The racks except those at the two ends of the building were double and had a close feeding division down the centre of each, hence the lambs in each division could take their feed on the two opposite sides thereof. At the same time they were thus furnished ample room for feeding without any crowding. Each compartment had a low wide door which was kept open all the time except in the stormiest weather. The yards adjoining the compartments, one for each group, extended out about 16 feet from the shed. All the food given the animals was

carefully weighed, and was given in two feeds daily. They were plentifully supplied with water and salt, but the groups which received ensilage and roots did not use much of the former.

Food and Feeding. The lambs in group I received a ration consisting of hay, grain and roots. The grain ration consisted of oats, peas and bran fed in the proportion of 2, 2 and 1. The roots consisted of turnips and mangels sliced. The hay, which was partly timothy and partly clover, was fed whole. Those in group II. were fed mixed grains, similar in quantity and quality to those in group I. In addition they received all the corn ensilage they would eat and also hay. Lambs in group III received the same quantity of whole oats by weight as were given of grain and bran to the lambs in group I and roots and hay also the same in character Those in group IV received the same quantity of wheat by weight as was given of grain and bran to the lambs in group I. The roots and the hay ration were also the same in character as when given to group I. Nearly the same quantity of roots was given to the lambs in group I, III, and IV, and the hay was given without limit in each instance, that is, they were given all the hay they would eat.

The experiment, therefore, was a test of the comparative value of a mixed grain ration in one case as against oats and wheat in making mutton, and all the value of ensilage as against roots for the same purpose in the other.

The following table gives the comparative cost of the food consumed by the animals of each group and also of the increase of live weight made by them :

	Group I.	Group II.	Group III.	Group IV.
Total cost of food per group	$55.450	$45.408	$52.013	$59.650
Average cost of food per day per lamb	.019	.016	.018	.021
	lb.	lb.	lb.	lb.
Total live-weight increase per lamb	29.040	25.200	25.320	29.130
Average live weight increase per lamb per day.	.242	.210	.211	.243
	c.	c.	c.	c.
Cost of food to produce 1 lb. increase.....	.080	.075	.086	.085

Fattening Lambs for the British Market.

This experiment commenced with the arrival of the lambs at the farm on the 14th and the 29th of September, 1892. It closed when the lambs were sold in Liverpool on the 22nd of May, 1893. They left the Farm for the British market on the 6th of May. It was intended to be substantially a repetition of the experiments conducted in 1891 and 1892, particulars of which are given in the Report for 1891, p. 113, and Report for 1892, p. 137. The principal objects of the experiment were to ascertain, (1) whether lambs could be fattened at a profit in the autumn and winter for the English market, and 2) whether the average grade lambs of Ontario are suitable for the purpose.

The Animals Selected. The lambs which were intended for shipment were purchased by Mr. J. E. Story, in the western and central parts of Ontario. There were in all 369 grade lambs; 186 came from western Ontario, and 183 from north-east of Toronto. Each lot of lambs was turned into the rape fields and fed upon the rape until October 6th, when 98 were chosen for the experiment. In selecting, compact, medium-sized animals were chosen, and especially those having dark faces, as far as they could be obtained. The lambs were shorn on October 11th and the few days following. They were then allowed to go together in a closed shed with yards attached until the latter part of December, although while the weather continued suitable they were pastured on

rape during the day and fed hay when necessary in the shed. The lambs were divided into four groups and fed on different rations until about a week before their shipment for England. These rations and all prices relating to this experiment will be given in connection with the experiment on feeding lambs on different rations, in a later portion of this report.

Food and Feeding. From the time that the lambs reached the farm, they were kept on rape until they were shorn. They were then allowed access to the rape in fine weather, and were housed at other times as already mentioned. From the close of the sub-experiment until the lambs were shipped, on May 6th, they were all fed upon a mixed grain ration with roots and hay. The grain was all fed unground. The roots consisted of turnips sliced. Hay, which consisted of clover and timothy, was all fed uncut.

*Food consumed by 98 lambs throughout the experiment was as follows:

Oats	6,959.96 lb.
Peas	3,260.14 "
Wheat	3,467.50 "
Bran	1,630.08 "
Roots	45,633.90 "
Hay	15,950.80 "
Ensilage	7,762.50 "

The average daily consumption of food per lamb from September 22nd until May 6th, exclusive of the rape given for a time, was:

Grain	.69 lb.
Roots and ensilage	2.41 "
Hay	.72 "

Estimated Value of Food. The food was estimated at the current values in Guelph, less the cost of marketing from an Ontario farm under average conditions. (See Bulletin LXVIII) The home value put upon the food by this method of reckoning was:

Oats	24½	per bushel.
Peas	57	"
Wheat	60	"
Bran	13 00	per ton.
Roots (sliced)	06	per bushel.
Ensilage	1 75	per ton.
Hay	9 00	"

It will be observed that in all probability the profit has already been made on the marketable food used, providing it has been grown upon a farm, as in this experiment the food was charged at the full market value less the cost of marketing from an average Ontario farm. This profit would be represented by the difference between the cost of growing the food and the market value put upon it.

Transportation. The lambs were put on board the cars at Guelph May 6th, *en route* to Liverpool. They left Guelph in charge of the farm foreman, Mr. J. E. Story, who accompanied them as far as Montreal and put them on board the steamship Mongolian along with the food necessary for the voyage, and secured a competent feeder, who cared for them on the way. The whole number sent over was 98, and all stood the voyage well and arrived in Liverpool in good condition.

Disposal of the Lambs. On arrival in Liverpool the lambs were taken in charge by Messrs. Bater & Williamson, live stock salesmen, Liverpool and London. Mr. G. E. Frankland, of Toronto, who was in England at the time when the lambs reached there, went to Liverpool and reported on the sale. The following is taken from Mr. Frankland's report: "Your lambs, numbering 98 head, arrived safe and in good order on

*The record of the food, other than rape, which was consumed by the lambs from the 17th to the 28th of December was unfortunately lost and therefore is not included in the report. The amount, however, would be very small.

Saturday, the 20th of May, and were much admired ; but the lamb and mutton trade is dull, and, after standing over them until 5.45 this (Monday) night, they were sold for 46 shillings each. There were many bidders, but their bids were from 43 to 45 shillings, until about 5 o'clock, a man named Robinson, from Manchester, gave 46 shillings. If these lambs had been later the price would have been less. Let me inform you that you have no more faithful agents than Bater & Williamson. They are honest and conscientious in all their work, and they pleased me well this day with your lambs. I came down from East Yorkshire, 125 miles, to see and assist in the sale of these lambs, and I am proud of the sale."

The following letter was received from Bater & Williamson, at Liverpool, May 27th : "Herewith we beg to hand your account of sales of the 98 lambs ex. ss. Mongolian, which we were honored by selling. The lambs were landed in good condition, and we are sorry to say our markets were not so good as last season, but we did our best with them and trust the result will prove satisfactory. We beg to return thanks for your esteemed favors. No doubt Mr. Frankland will have written to Prof. Shaw a full account of their condition, etc."

Values. The value put upon the lambs at the commencement of the experiment was the average price paid for the full number of lambs when let down at the Farm. The cost of shearing was put at 5 cents per animal. The following table gives the financial results of the experiment :

Cost of 98 lambs when landed at Guelph	$395 92
" shearing	4 90
" food	280 85
" attendance	27 31
" shipping to England	291 45
Total cost	$1,000 43
Value of 98 lambs in England	$1,097 66
" wool	59 83
" manure	220 04
Total value	$1,377 53
" gain	377 10
" gain per head	3 85

The cost of attendance was reckoned at the same rate as in the corresponding experiment of the previous year, in which it was assumed that one man would feed and care for 800 lambs when the feed was all prepared. The quantity of manure produced and the value placed upon the same was reckoned in the same way as in the experiment of 1892. In that experiment the average amount made per head was 5.81 lb., which would be worth .993 of a cent, or practically one cent a day. This included bedding also. The wool averaged 4.69 lb. per fleece, and sold for 13 cents per lb. unwashed. The cost of sending lambs to England was $291.45, or $2.91 per head. It was 60 cents per head less than in the corresponding experiment of 1892, and $1.20 per head less than in the corresponding experiment of 1891. The following are the items :

MONTREAL EXPENSES :

J. E. Story, rail and hotel	$18 05
Railway freight	61 00
Food during voyage	18 22
H. & A. Allan, wharfage	1 96
Stock yard charges	4 04
	$103 27

Liverpool Expenses:	£	s.	d.	
Ship's freight	24	15	0	
Market charges	0	10	0	
Keep and lairage	1	13	0	
Droving	0	12	6	
Dock charges	1	12	8	
Dues and entry	0	10	0	
Gifts	0	5	0	
Cartage	0	5	0	
Commission	3	13	6	
Caretaker's dues	2	0	0	
G. Frankland	3	0	0	
	38	16	8	
				$188 18
Total expenses				$291 45

The average individual value at the commencement of the experiment was $4.04.

The average price for which they sold in Liverpool was $11.20.

The average advances in value, therefore, was $7.16.

The following table gives the average prices realized for the lambs exported to England during each of the years 1891-2-3, and also the average cost of shipment:

——	1891.	1892.	1893.
Number of lambs exported in each experiment	100 lambs.	99 lambs.	98 lambs.
Weight per lamb before shipment	121.5 lb.	132.2 lb.	138.2 lb.
Selling price per lamb in England	$11.79	$11.53	$11.20
Cost per lamb for shipments and sales	$ 4.17	$ 3 61	$ 2.97
Selling price per lamb in England, less cost of exportation	$ 7.62	$ 7.92	$ 8.23
Price per pound of live weight in England	8.73 cents	8.64 cents	8.10 cents
Cost per pound of live weight for shipments and sales	3.43 cents	2.73 cents	2.15 cents
Price per pound of live weight in England, less cost of exportation	5.30 cents	5.91 cents	5.95 cents

Co-operative Experiments.

About 100 plots were grown at this Farm in 1893, in conjunction with 7,181 plots grown by ex-students and other farmers throughout Ontario. The following is a list of experiments conducted during the past year. The results of these will be found in the Experimental Union report at the end of this volume.

Testing nitrate of soda, superphosphate, muriate of potash, mixture and no manure with oats.

Testing nitrate of soda, superphosphate and no fertilizer with rape.

Ascertaining the relative value of three varieties of millet.

Growing Lucerne as a crop for fodder.

Testing six promising varieties of fodder corn.

Testing five promising varieties of turnips.

Testing five promising varieties of mangels.

Testing five promising varieties of carrots.

Testing six promising varieties of spring wheat.
Testing six promising varieties of barley.
Testing six promising varieties of oats.
Testing four promising varieties of peas.
Testing five promising varieties of winter wheat.

Experimental Building.

During the year 1893, upwards of 1,600 plots were devoted to the experimental work at this Farm, and over 7,000 packages of grains, seeds and fertilizers were distributed among the farmers of Ontario. It is impossible to do this work in a truly satisfactory manner with the present accommodation. About 1,000 distinct lots of grain and potatoes are now stored in the cellars and upper rooms of six of the buildings located on the College grounds. We are compelled to use nearly the whole of the basement of the chemical laboratory for work rooms, and an upper compartment as an office. These are far too small for our work, and besides are now greatly needed by the chemical department. Farmers and others visiting the College during the winter season have but a poor opportunity of exchanging the various products which have been grown upon the experimental plots during the season.

It is of great importance that an experimental building be erected upon the College grounds where work would be accomplished during the winter months in preparing grains, seeds, fertilizers, etc., to be used the following season for sowing upon the station plots, and also for distributing among the farmers of Ontario; where the various products of the experimental plots could be preserved for close examination and for testing in different ways; where the reports could be prepared with the different products close to hand for reference; where an exhibition of all the varieties of grain both in the straw and in the sample jars could be neatly arranged for the benefit of farmers and others visiting the College; and where a general office, a private office, a dark photographic room, and storage rooms for fertilizers, etc., could be provided.

Conclusion.

In conclusion, allow me to thank you and through you the Minister of Agriculture for the confidence which you have placed in me in putting me at the head of the Experimental department, and also for the able support you have given me in advancing the work of this department.

Respectfully submitted,

C. A. Zavitz,
Experimentalist.

Agricultural College,
Guelph, Dec. 30th, 1893.

PART IX.

REPORT OF THE

PROFESSOR OF DAIRYING.

To the President of the Ontario Agricultural College:

SIR,—In presenting the report of the Dairy Department for the year 1893, I do so feeling that the year's work has been successful. Through the liberality of the Minister of Agriculture, we have been able to make progress along several lines. The dairy school, operated this year for the first time, was so decided a success, that it was felt increased accommodation would be necessary. Consequently, when funds sufficient to build and equip a new dairy building were asked for, the money was granted, and at the present writing the new dairy hall is nearing completion, and will, we expect, be ready for occupation by the class of 1894.

A couple of cottages built this year for the dairyman and cattleman will enable us to do better work and give closer attention than formerly. Previous to this time there has been no one living close to the dairy who was connected with it, and the risk of having all the stock, buildings and implements without some one near was too great.

By being relieved of so much outside work, I feel that better instruction has been given to students. If a lecturer is to do justice to his subject, his class and himself, he must meet them regularly. All lose interest where this is not done. Owing to the fact that I have had so many meetings to attend away from the College during the terms previous to this year, my classes have been neglected. During 1893 this has been largely remedied.

You will find my report under the following heads:

I. TEACHING.

II. DAIRY SCHOOL.

III. DAIRY STOCK.

IV. EXPERIMENTAL WORK OF 1893: Creaming and Churning, Composite Testing, Cheese, Feeding.

V. TRAVELLING DAIRY.

VI. MISCELLANEOUS.

I. TEACHING.

The addition of a lecture room to the dairy building has made it possible for all students to receive their lectures at the dairy, which is a decided improvement on giving them in the class-rooms of the College proper. Illustrated lectures, where possible, are the best in teaching a subject like dairying, and where the utensils and articles referred to may be brought before the classes, such as we are able to do now. It gives students a better insight into the subject, and causes them to take a deeper interest in it. Formerly we had the utensils, etc., for illustration, but it was a difficult matter to take them over a quarter of a mile to the College.

Dairying being a subject which is not inexhaustible, the ground may be covered quite thoroughly in two years. For third-year students we shall in future arrange to make the work nearly all practical. This we can do with our increased and more efficient accommodation.

The teaching during the past year has been not only by lectures, but a good deal of practical work was given to the students—more than has ever been done before in this department. After the special dairy school was over, the regular College students came to the dairy each day for two weeks. We had our special instructors in cheese-making, butter-making, milk testing and running of separators, besides having a large quantity of milk. Thus we were able to give them two weeks of dairy work, which resulted in a better comprehension of the subject from a practical standpoint than has ever been gained by our students. During 1894 the work will be repeated and made even better than this year.

This practical work appears to be what our students ask for, and so far as possible we wish to turn out men who know how to do dairy work, as well as they know the theory of dairying. One difficulty met with last year was the fact that this practical course came on just before the Easter examinations, and students did not devote as much time and thought to it as might have been done. By having the dairy school open two weeks earlier, we hope to overcome this difficulty during next year.

Lectures and practical work were given also to the special course students, of which I shall speak under the head of Dairy School, and to the teachers who were at the College during July. Six lectures on the subject of dairying were given to this class, besides instruction in separating cream, churning, making butter, testing milk with lactometer and Babcock tester.

Thus, so far as teaching is concerend, the year has been a busy one, more lectures having been given on the subject of dairying than during any previous year. The growing importance of this industry to the farmers of the Province warrants special attention, and it is to be hoped, that, through the regular College students who attend each year, through those also who take the special dairy course, the teachers, and the thousands of farmers and others who visit us, that the seed sown may bring forth abundantly, and that the results will show a marked improvement along all dairy lines. To reach the very top is our ambition, and to have all dairymen do the same is the object of the Department. That this end may be accomplished it will be necessary for us to have an opportunity to observe what others are doing, and also that our equipment shall be the very best. So far we have had little reason to complain.

II. DAIRY SCHOOL.

We may justly say that this new venture was a success beyond our highest expectations. Room for 50 students was provided, and some of our friends thought if we got half that number the first year it would be a good beginning. Instead of 50 there were over 100 students who asked permission to enter the school. As a consequence a great many were prevented from coming. Those who did not enter this year have been allowed the first privilege for 1894. Long before the course of 1894 will open, the space was all taken, and this without any advertising whatever. By November 1st, 1893, there had been over 130 applications received, and as we have room for but a 100, we are refusing them for lack of room. It is hardly likely that this demand will keep up for many years, but if it does it will be necessary to make provision to meet it. Shall the people of this Province ask to receive instruction in regard to dairying and it not be granted? Judging from the liberal policy of the Government in the past, and the good use our people make of dairy help which is given to them, it would seem that if they ask they shall receive.

During the first year there were altogether 62 students who attended the dairy school, five of whom were ladies. Some of these students staid but a short time, others for a month and some stayed until nearly the close, but as their factories opened about April 1st, they had to leave before the final examinations. There were 31 who passed their examinations successfully, and have been granted certificates. Those who were entitled to certificates and who have been managing cheese factories during the past season, have been visited by a representative of the College, or else we have received reports from reliable persons that they are doing good work. We are indebted to the Western Dairy-

men's Association for kindly allowing their inspector and instructor, Mr. T. B. Millar, to do this work for us, and also to Mr. Millar for the efficient manner in which he performed his duties, in visiting the dairy students at their factories.

As to the manner of working and teaching during the term, I cannot do better than quote a writer in one of our agricultural journals:

A Day in the Dairy School.

"Canadians are a practical people, and are not inclined to accept theory readily unless accompanied by practical illustrations. Owing to this fact, the methods adopted for imparting instruction in Canadian institutions are becoming daily more practical. In this connection it is gratifying to note that the special dairy school established at Guelph by the Hon. John Dryden, Minister of Agriculture, is fully up to the times.

"For the purpose of letting our readers know what is being done at this school, and also of giving them an idea of the methods adopted in imparting the information given, on the 14th of March we paid the school a visit, and spent the day amongst the students. At half-past eight work commences, and the first hour of the day is spent in attending a lecture. Several of the professors of the Agricultural College give instruction along their own particular line during the term, which lasts for eight weeks. Several lectures are given on each of the following subjects: Chemistry, botany, geology, mathematics, book-keeping, veterinary, agriculture, and dairying. In teaching these subjects the professors deal with them specially as they affect or bear upon dairying generally. At half past nine the class breaks up into four divisions, one set of students retiring to the testing room, another to the separating room, the third to the butter-making department, and the remaining set to the cheese room. These divisions are changed about so that all students have their turns in the different departments. In the testing room we find the students determining the percentage of butter-fat in samples of cheese, or trying to detect impurities, searching for adulterations in milk, or determining by the Babcock or Beimling test the percentage of butter-fat in cream, whole milk, skim-milk, or buttermilk, or, perhaps, running the oil-test churn, so that the scholars become thoroughly familiar with the operation of all testing appratus of any value that are used in the dairy. Supervising the department is W. J. Palmer, B.S.A., who spent the past summer as manager of one of the travelling dairies. In department No. 2, where the separating is carried on, F. B. Linfield, B.S.A., also a travelling dairy manager, guides the erring minds aright. Here we find the students managing separators and butter extractors. By practical observation they become familiar with all the ins and outs of working these machines, and also learn the advantages and disadvantages of the different methods of getting the butter fat out of the milk, such as the setting of the milk in shallow pans or Cooley cans, extracting the cream by means of a separator, or at once taking out the butter by means of a butter extractor. Next in turn is the butter-making room, which Mr. Rogers, an experienced butter-maker, superintends. Several churns are kept going, and two students are in attendance at each churn. One student is responsible for the quality of the butter made, while the other acts as his assistant. The next day that this division makes butter the positions of the two are reversed, the previous assistant taking charge, while his former manager lends him a helping hand. In this way each is made responsible for the quality of the butter made during the day that he or she has charge of the churn. Here it might be mentioned that the five ladies in attendance have made excellent students, have become proficient butter-makers, and no longer attribute inferiority of product to luck, witches, or the position of the moon, but can give a scientific and common-sense reason for each defect in flavor, grain, or color. These young ladies are deserving of the highest commendation for the step which they have taken, and no doubt, now that these have had the courage to step forward and break the ice, many others will, in another season, follow their noble example. But not to linger here too long, as we have yet to visit the cheese-making room, we proceed, and, entering, we find Mr. Bell, of Tavistock, assisted by Inspector Millar, two of Ontario's best cheese-makers, in charge.

"Set in two rows of three each are six vats; and two students are stationed at each vat, one assisting and the other in charge, as already mentioned in connection with the butter-making The vats are all lettered, and in the morning a given weight of milk is put into each. An accurate record is kept, so that it is known just how much cheese each student makes out of the milk given him. The cheese made are also marked, so that the student at any time may examine the cheese that he himself has made, and, finding out its defects, learn the causes for the same, and thus be enabled to avoid the errors in his next attempt.

"In the afternoon, when the other work is over, the students assemble in the class-room, which opens upon the cheese-making room, and conduct among themselves an informal discussion, which is usually led by one of the members of the class. Prof. Dean informed us that on Monday afternoons the subject of separating was usually taken up; Tuesday afternoons, milk-testing; Wednesday and Thursday afternoons, cheese-making in general and the difficulties met with during the various seasons; on Friday afternoons samples of cheese are brought out, and the time is spent in the judging of cheese by points; and on Saturday afternoons butter-judging is taken up in the same way. During the afternoons of Tuesday and Friday Prof. Dean also spends some time with the class in the stables, judging dairy cattle.

"From this description our readers, we hope, will be able to form some idea of the work going on at the dairy school, and the visitor cannot but be impressed with the immense practical value of such a course of instruction to one who is in any way connected with dairying. The presence of the ladies, and the clean, tidy appearance of the entire place, enhanced by the spotless white attire of the students, are features which cannot fail to produce a favorable impression upon those who visit this institution.

"The afternoon informal discussions, which, we believe, are a new departure, are of inestimable value. The experience of some thirty or forty of Ontario's most practical cheese and butter makers is given to the class; and thus, by collecting the wisdom of a number, all are made wise. The students unanimously express themselves as specially pleased with this feature of the work. But making all the students actually perform all the different operations in connection with the testing, the separating, the butter making and the cheese-making is the grandest plan of all.

"As we said in the beginning, Canadians are a practical people, and must be taught in a practical way. This principle is admirably carried out, as the students are not simply told how to correctly perform the difficult operations, but are required to actually go through the work themselves. From what we saw and heard during our visit to the school, we feel that it is not hazardous on our part to predict that double the present amount of room will not more than accommodate those that will make application for admission when another session opens. We realize that this school is doing a grand work in the advancement of Canadian dairying; and such institutions will always have our most earnest support and assistance in extending their educating influence throughout the length and breadth of our land."

Some difficulties were met with in conducting the school, and chief among these was a sufficient supply of milk. Owing to the time of the year, we found it no easy task to secure about 4,000 pounds of milk a day for our students to work with. In some cases we had to ship it about 40 miles by rail, besides having two teams on the road collecting from farmers in the vicinity of the College. For this work we made use of the Travelling Dairy teams. The price we had to pay was very high, so that the product when sold did not realize what was paid for the milk, though it brought good prices.

It is with pleasure we record the fact that several of our students were prize-winners in cheese at the chief fairs of the Province; and among those who scored 99⅞ points in cheese out of a possible 100 at the World's Fair, Chicago, was Mr L. A. Zufelt, of Chesterville, who headed the list on examinations at the close of the term. This is very gratifying to us as well as to himself.

To the young ladies who attended in 1893, three of whom received certificates, we are indebted for the courage shown in making a start towards breaking down prejudices that exist against scientific dairying. The good order which existed during the whole term was no doubt brought about largely through their silent, restraining influences.

We hope that a larger number may be present during 1894. Special inducements are offered to farmers' daughters and farmers who wish to become acquainted with the latest and best methods of home dairying. By devoting a portion of the present building specially for farm dairy work, and employing a competent instructor, who will devote the whole of his time to this branch of the dairy, we hope to benefit a number who could not, or would not, care to take the full course. This work we intend paying special attention to during the coming year, and hope to be able to announce before long that our dairy will be open at any and all times to those who wish to come and stay with us for a short or long period.

III. DAIRY STOCK.

The dairy department has suffered severe losses of cows during the year from tuberculosis. The trouble appears to have originated in a couple of imported cows. At the present time our stock consists of: Cattle—3 Jerseys (2 cows and a heifer); 4 Holsteins (3 cows and a heifer); 3 Ayrshires (2 cows and a heifer); 4 Guernseys (2 cows and 2 heifer calves); 2 Red Polled (a cow and a heifer calf); 6 grades (4 cows, 1 heifer and 1 heifer calf). Besides these, we shall offer in the annual sale 3 Ayrshire calves, 2 Holstein and 2 Jersey calves. One grade cow has been sold for beef, and we are feeding an unprofitable Ayrshire cow and a yearling heifer for the shambles. We have also 21 pigs and a horse.

Our stock of cows is still too small for proper experimental work and for furnishing such a supply of milk as is needed for cheese and butter-making. We should have 30 milking cows to carry on the work properly and to furnish material for students to work with.

During the year we have continued weighing each cow's milk separately night and morning, and taking tests two days of each week for the per cent. of fat. I would again call attention to the fact that more work is needed in this direction. If weighing the milk every day is thought too much labor, weigh once a week and multiply by seven, or once in two weeks and multiply by fourteen. Tests once a week or once in two weeks will give a fair idea of the quality of the milk. This is the only practical way we may arrive at the individual value of the cows of the herd.

Record of Dairy Cows from Dec. 18th, 1892, to Dec. 3rd, 1893.

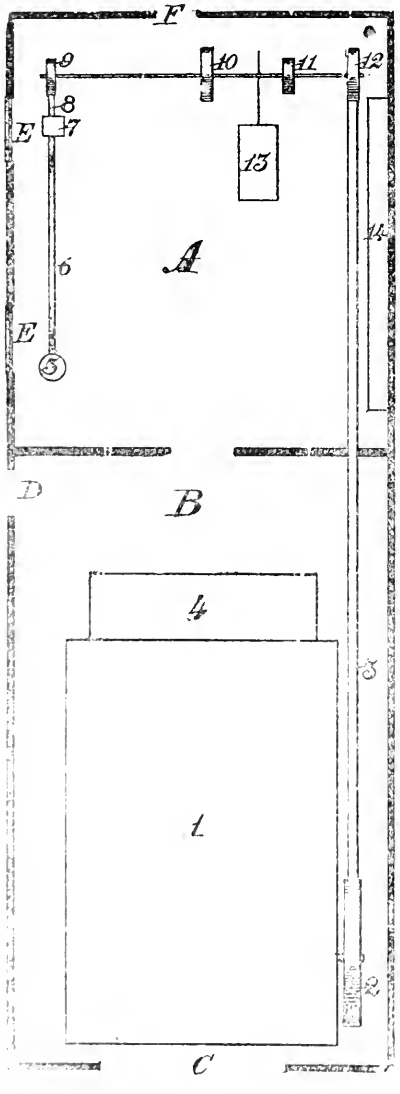
Name of cow.	Weight lb.	No. of days milking	Last calf.	Total lb. milk.	Per cent. of fat			Total lb. fat.	*Total lb. butter.
					Highest	Lowest	Average		
Cherry	1,110	231	Apr. 11, '93	5,356	4.85	3 13	3.85	206.2	226.8
Blue Bell	960	238	Apr. 10, '93	6,404	6.40	3.20	3.95	253.0	278.3
Spot	1,015	293	Jan. 30, '93	8,796	4.35	3.02	3.73	328.1	360.9
Dairy Queen	1,060	273	Feb. 28, '93	8,358	4.20	2.87	3.46	289.2	318.1
Old R	900	294		6,531	4.15	2.90	3.49	227.9	250.7
Artis Kassie	1,203	287	April 22	9,662	3.90	2.30	2.90	283.1	311.4
Alvo	1,055	284	Dec. 2, '93	7,289	4.35	2.55	3.29	239.8	263.7
Artis Kassie Queen	900	301	Feb. 4, '93	6,333	3.80	1.90	3.16	200.1	220.1
Lisgar's Rose	892	252	Mar. 30, '93	6,569	6.40	4.22	5.21	342.2	376.4
Duchess	988	294	Dec. 3, '92	3,710	4.75	3.20	4.00	148.4	163.2
Patience	1,078	238	Apr. 3, '93	6,477	4.82	3.30	4.16	269.4	296.4
Nellie	870	210	Mar. 21, '93	4,023	4.30	2.90	3.46	139.2	153.1
Joan	1,015	250	Mar. 9, '93	5,818	5.02	2.95	3.87	225.2	247.7
Sarah	....	65	Sept. 8, '93	1,247	5.35	4.45	4.73	59.0	64.9
Anna	1,020	266	Jan. 19, '93	3,561	5.66	3.35	4.23	150.6	165.7
Lisgara	917	163	Aug. 21, '93	3,002	6.00	3.60	4.65	139.6	153.5

* Butter calculated by adding one-tenth to the fat.

A Cream Separator at the Dairy Barn.

The building is a frame one, joined to the stable. It is boarded up and down on the outside, and battened and painted. The inside of the separator room is lined with matched lumber and paper. The tread power room is unlined.

The accompanying ground floor plan will show how the power and separator are arranged.



A.—Separating room, 11 ft. 4 in. wide, 13 ft. 4 in. long.

B.—Tread power room, 18 ft x 11 ft. 4 in. Inside measurements in both cases. Ceiling, 8 feet high.

C.—Large doors in front of power.

D.—Door where horse is brought in and taken out.

E.—Windows.

F.—Door into cow stable.

1.—Tread power.

2.—Tread power driving wheel, 4 ft. 4 in. diameter.

3.—4-inch leather belt, 28 ft. long, connecting power with pulley on shaft.

4.—Platform for horse to get on power. (This should be well fastened.)

5.—Separator.

6.—Belt from intermediate to separator.

7.—Intermediate, or jack, distant 7 ft. 3 in. from separator.

8.—2-inch leather belt, 6 ft. long, connecting pulley and intermediate.

9.—Pulley to drive intermediate, 12 in. in diameter.

10.—Pulley to drive cutting-box, 20 in. in diameter.

11.—Pulley to drive pulper in cellar below, 12 in. in diameter.

12.—Pulley, 20 in. in diameter.

13.—Pair spring balances for weighing milk.

14.—Shelf for taking samples of milk.

The separator we use is a No. 3 Alexandra, with a skimming capacity of 1,000 lb. per hour. Our power is one made at St. George, Ont. Both of these work well. The plan adopted is to bring in "Joe" (the horse) when the cows are all milked except one or two, and by the time these are milked the cream from fifteen cows will be in a can ready to go to the dairy, and the skim-milk in another can ready to be fed to calves and pigs.

This method of having the separator at the barn has several advantages, of which we may mention:

(1) It saves carrying the whole milk to the house or dairy and the skim-milk back again to the barn for feeding the calves, thus saving labor.

(2) It saves fuel otherwise necessary to heat the skim-milk for feeding; besides, we think the animal heat of the milk is more valuable than artificial heat.

(3) The skim-milk is in the very best condition for feeding, being warm and *sweet*.

(4) The separator method will produce more butter than the setting methods employed, and, as a rule, it will be better in quality.

As a number of dairymen will be considering the advisability of improving their methods for the winter manufacture of butter, where no factories are within reach, we shall be pleased to answer any questions relating to the above.

Further Points—Separation of Milk at the Barn.

From a letter received the other day from a prominent dairyman in Eastern Ontario I am led to believe that there are some further points in regard to separating milk at the barn. This gentleman says, "I believe that I can use part of my barn for the purpose;" and says further, "I believe that your plan is a first-class one, and that many farmers will adopt it or something like it."

He asks the following questions:

"(1) Do you use a one or a two-horse tread power?"

Our power is a two horse one, but for separating milk or pulping turnips we use but one. It is easy work for one horse. A pony could do the work very well, or even a bull that could be made to get on to the power. I have seen difficulty in getting some animals on to the power. For cutting feed two horses are necessary, and thus when buying a tread power one should consider all the purposes for which he is likely to use it, and purchase accordingly. For dairy work alone a small power is all that is needed, "and this," a gentleman remarked in my office, "should be built and sold for from $60 to $70." What say the manufacturers to this?

"(2) Where do you get the warm water from to wash the separator, etc.?"

At present we carry the bowl, pans, spouts, pails, etc., to the dairy building, which is about 200 feet away, and wash them there. We could easily take a steam pipe to the separating room, and wash there, but I am afraid to leave the bowl, etc., at the stable for fear that they might become tainted with stable odor. No matter how careful a person may be, there is always risk in leaving utensils about the cow stable. This is especially the case when the building for separating happens to be on the same side of the barn as the cattle yard and the manure shed. In the arrangement of our barn we could not conveniently have it otherwise, but where the room for separating could be built on the opposite side to the yard, and manure, I should not be afraid, not only to separate the milk, but to keep the cream and make the butter in the same building. I would have double doors between the stable and such a dairy, so that no cow stable odor could penetrate. By having good ventilation there would not be much risk.

Where washing is done at the barn, be careful to see that the bowl of the separator and other utensils are well aired where the atmosphere is pure.

"(4) Do you churn with the tread power?"

We do not use the tread power in churning, for the reason that we have an engine in the dairy which can be used in case of a large churning. For small churnings, such as many of our experimental ones are, the "Armstrong" power, furnished by our good butter-maker, Mr. Rogers, is made use of. Sometimes students are employed at this work. The tread power could be easily attached to a churn, and in cases where the air may be kept pure, in some such way as I have indicated previously, the churning and all the work may be done at this dairy building, connected with the barn.

I may mention, also, that we have been making some trials with a churn constructed and worked on an entirely new principle. It is called the pneumatic churn, and was invented by a New Zealand gentleman. The process of churning is accomplished by forcing air through the cream. The churn is stationary, and there is nothing in the shape

of dashers which work in the cream. To stand and watch it at work reminds one of the days when we used to "boil sap," or boil water when killing hogs. The cream is kept in a continual bubble. It is too early to report results.

The circular silo, of which a full description was given last year, has worked well. We did not have enough corn in 1892 to fill it much more than half full, yet the product was good. This year it has been filled to the top, and though the corn did not get so well matured as last year, the ensilage so far has been of good quality. Some millet cut into the silo along with the corn did not, apparently, improve either the millet or the corn.

I may say that we still consider corn ensilage the cheapest bulky portion of the ration that we can feed. A ration of 50 lb. corn ensilage, 6 lb. hay, 4 lb. bran, and 4 lb. of ground wheat gave us good results last winter. At the present price of wheat it is about the cheapest grain feed that may be fed to dairy cows.

The dairy, stables and piggery, plans and descriptions of which were given in the last report, have proven very satisfactory.

We are indebted to the Farm Department for the corn which was grown and filled in the dairy silo (about 250 tons). Also, for mangels, sugar beets, straw for bedding, about 12 tons of hay, the growth of fodder and pasture for the dairy stock, and for help at various times during the year.

Leaking Teats.

A dairyman writes to know what appliances may be used to prevent cows leaking their milk, and how much they would cost.

The cause of leaking teats is the very opposite of the cause of hard milking. The reason why a cow is a hard milker is that the sphincter muscle which closes the opening or duct of the teat at the bottom is too tense or hard, and will not yield sufficiently to the gentle pressure of the hand of the milker. Sometimes it is caused by lack of sufficient space in the duct of the teat which leads from the cistern above to the opening below. The leaking, then, is caused by this muscle not being strong enough to withstand the downward pressure of the milk from the ducts above. Sometimes the loss is considerable, and the remedy not very satisfactory. The most common remedy is to place a rubber band around the teat, which closes the opening in much the same way as the muscle. This band should be at least half an inch wide. The objection to the use of the band is that it stops circulation more or less, and is likely to result in damage to the teat if continued too long.

The author of the *Dairyman's Manual* says in reference to this matter: "It is doubtful if any permanent remedy can be found for it. A temporary preventive, and one not at all difficult of application, is to smear the teats of a leaking cow with photographers' collodion as soon as she is milked. A bottle of collodion may be kept in the barn (always well corked, or it will evaporate very soon), and a small quantity may be rubbed over the teat and on the end of it with the finger. The collodion contracts considerably as the chloroform evaporates from it, and practically forms a tight bandage around the teat, which compresses the duct. When, as is sometimes the case, a cow will lose two or three quarts of milk a day, it may pay to use this remedy.

A Precocious Milker.

On March 27th, 1892, one of our best grade cows dropped a heifer calf, sired by a Holstein. This calf has been well fed—not on fattening foods—ever since, and is at the present time a thrifty yearling. Early in the summer I noticed that her udder had developed considerably, and on examination it was found to contain a quantity of fluid matter, resembling milk. On July 7th, we commenced milking this heifer, and since that time have been milking her every day. The quantity of milk given was very small, though it increased slightly. In appearance, it was very watery at first, but kept improving. The most interesting part is the fat contents of this milk like secretion. The first time she was tested, on the 7th of July, the per cent. of fat was .4 (four-tenths) of one per cent. On July 8th she tested 1.2 per cent., showing a marked increase in this short time. July 12th she again tested 1.2 per cent.

We continued to milk this heifer and noted the following points:

1. The increase in quantity of milk.
2. The increase in per cent. of fat.
3. The effect on the milking ability of this heifer.
4. The effect on the health and growth of the animal.

At the time when we commenced milking her she had not been bred, but in a day or so after she was mated with her sire.

From this trial we should judge that the fat is not secreted as early as the other constituents of the milk, and, judging from the action of the sulphuric acid when added to the milk in making a test, there did not seem to be the normal amount of sugar present, but a greater proportion of the curdy matter.

In this connection we may mention that milk from the injured quarter of a cow's udder tested very low, while the milk from the other three quarters tested 3.40. The milk from the quarter which was hurt by a hook or stick or something else tested but .5 (five-tenths) of one per cent.

The fat of the milk is the most valuable constituent, and its secretion appears to be very easily influenced adversely.

Moral: See that the cows are treated kindly, and not injured in any way that can possibly be avoided, as it means a loss of fat.

At this writing (Nov. 13th), the Holstein grade heifer referred to above is still milking, though the quantity of milk is only about a pint per day. The per cent. of fat, however, has increased very much. November 9th she tested 3.7, and November 10th 3.8 per cent. of fat. So far it has not apparently affected her health or growth. It is too soon yet to see the effect on the milking ability.

Rearing Calves for the Dairy.

It is a mistake to have calves intended for the dairy kept too fat. For beef it is all right to keep them fat from the start, but for the dairy it is not wise. What we want of these calves is milk, not beef, and if they early get into the habit of making beef out of their food instead of milk, it is safe to predict that they will always do this. Keep dairy calves growing and thriving, but *not fat*.

Now is the time to raise the calves intended for future dairy cows. Select those from the best cows that have been bred to males of the milky breeds. We leave the calf with the dam for about one day, and then remove it to a pen by itself; but still continue to feed it the milk of its own dam for from one to three weeks, according to the calf's robustness. We then gradually substitute warm skim-milk, until by the time the calf is two weeks to a month and a half old it is getting skim-milk altogether. If the supply of skim-milk is limited, boil good, clean, well-cured hay, making what is known as "hay tea," and make up the deficiency with this. For a calf two weeks old $1\frac{1}{2}$ gallons twice a day, or a gallon three times a day, would be ample. Increase the ration as the calf grows older.

Into the skim-milk, or milk and tea, put half a teacupful of flaxseed jelly, made by boiling flaxseed. Increase this gradually until the calf is three months old, when it may be fed each day about half a pound of seed made into jelly. In all feeding, the person in charge must exercise judgment. What would be ample for one calf would not be enough for another, as their appetites and capabilities of digesting food vary widely. Some nice clover hay will tempt the calf to nibble at it, and soon it will eat quite a quantity of it. A small box in the stall containing ground oats (sifted), bran, and oil cake, mixed in the proportion of 2, 2, 1, will add to the thriftiness of the calf. There is no danger of its eating too much of the dry meal during the first three months of its life. Oatmeal porridge or oil-cake boiled may be used instead of the flaxseed jelly. Feed what the calf will lick up clean.

If there is skim-milk for the calf, it will do all the better if it gets it till it is six or eight months old; but if this is not available, gradually substitute water after four months, and get it accustomed to taking it at about 60° F. Still continue feeding the hay, and for variety some roots or ensilage may be fed, the latter sparingly if it is very sour. At no time would I feed ensilage in large quantities to very young animals.

If the calf gets too fat, reduce the *ad libitum* meal ration to about a quart per day of bran, oats and oil-cake This ration is for a calf over four months old.

Calves raised in winter are ready to be turned out by the time grass comes, if thought advisable. Our practice has been to keep them in altogether during the first year, or at most to allow them out for only a short run during the evening, or in fine weather, when it is not too hot, and the flies are not too troublesome.

The calf pen should be kept *clean and dry* at all times.

The requisites for a calf to develop into a good dairy cow, summed up, are:

1. It should be well-bred (not necessarily pure-bred), of healthy stock, dropped between October 1st and February 1st, and a "thriver" from the start. *Raise no others.*

2. It should have its dam's milk for a week at least, and after that warm skim-milk (that from the separator, where it is creamed directly after milking, is best, as it still contains the animal heat of the cow), together with some cheap food to replace the butter or cream taken out of the whole milk. Such feed will produce a good calf. We can't afford to feed 22-cent butter to calves.

3. Regularity, cleanliness, and kindness throughout in the treatment of the animal.

IV. EXPERIMENTS OF 1893.

Creaming Shallow Pan, Deep Pail and Separator.

Commencing in May this year we have, during each month, been setting one-third of the mixed milk from the whole herd in shallow pans, one-third in deep pails and one-third has been run through the hand separator. This was continued long enough each month to get a churning of cream from each method, the time required to collect a churning was from 2 to 4 days, depending upon the quantity of milk at our disposal. In every case the milk was all mixed together before being divided among the three methods for creaming.

The objects of the experiment were:

1. To see what loss of fat there would be in the skim and buttermilk from each system.
2. To see the effect on the quality of the cream and butter by the different methods.
3. To see the effect on the feeding quality of the by-products.
4. To note the labor and expense connected with each.

This work is still being carried on, and we hope to be able to determine what are the actual differences and losses by these most common creaming methods now employed by farmers and dairymen. By conducting the experiments every month throughout the year, we hope to gain knowledge as to the effects of different seasons and different periods of lactation.

Summary. During the six months, from May to October, there was creamed 3,081 pounds of milk—1,027 by each method. This milk contained 115.17 pounds of butter-fat and made 127.58 pounds of butter. The total loss of fat in skim and buttermilk by separator method was .47 pounds; by deep pail, 1.67; and by shallow pan, 3.29 pounds. The per cent. of loss in butter-fat was 1.2 by separator; 4.3 by deep pail; and 8.5 by shallow pan. It will be remembered that all the methods were handled in the very best manner, and that the losses by the latter two methods would be much greater as ordinarily used.

As to the quality of the cream and butter we could see little difference between the deep pail and separator. The separator butter was possibly a little better for a short time after being made, but the deep pail proved somewhat better in keeping quality. The shallow pan butter was inferior to the others in every case, though it was fair in quality and was better in October and November than during hot weather.

The skim-milk was best from the separator, deep pail next and shallow pan poorest. During the hot weather it was sour in most cases when the pans were skimmed.

In reference to labor and expense we would say that in handling small quantities of milk there is least labor with the deep pails, in case everything is handy. Unless a person has sufficient cows to warrant the purchase of a power separator, we are inclined to think that turning a crank for 1 to 2 hours night and morning will grow wearisome and the labor will be greater than with deep pails. The deep pails save much labor as compared with shallow pans.

After the first cost of the machine and power, the difference in running expenses of the three methods will not be very great.

Loss of Fat.

Month.	Method.	Skim milk.		Buttermilk.		Total pounds of fat lost.
		Per cent.	Total lb.	Per cent.	Total.	
May	Separator	trace.	.....	0.30	0.07	0 07
	Deep pail	0.19	0.36	0.10	0 04	0.40
	Shallow pan	0.40	0 79	0 20	0.07	0.86
June	Separator	trace.	.....	0.1	0.03	0.03
	Deep pail	0.2	0.30	trace	.....	0.30
	Shallow pan	0.33	0 51	0.1	0 02	0 53
July	Separator	0.03	0.04	0.1	0.03	0.07
	Deep pail	0.20	0.26	0 05	0.01	0.27
	Shallow pan	0.43	0.55	0.1	0.03	0.58
August	Separator	0.03	0.04	.....	.....	0 04
	Deep pail	0.13	0 17	0.1	0 03	0.20
	Shallow pan	0.31	0.40	0 1	0.03	0.43
September	Separator	0.02	0 03	0 2	0.04	0 07
	Deep pail	0 22	0.25	0.1	0.03	0.28
	Shallow pan	0.44	0.51	0.2	0.04	0.55
October	Separator	0.08	0 13	0.2	0.06	0.19
	Deep pail	0 13	0.16	0.2	0 06	0.22
	Shallow pan	0 23	0 28	0 2	0.06	0.34

Creaming Quality of Different Cows' Milk.

The losses of fat in skim milk varies not only by the different methods of setting, and different ways of handling these methods, but it also varies according to the individuality of the cow. Some cows' milks cream very much more early than others. In cases where the setting methods are adopted it is well to have cows that not only give rich milk and plenty of it, but also cows which possess good creaming quality in their milk. The following average losses of fat in skim milk from twelve of our cows, the milk from each of which was set separately for a number of times, will illustrate the difference that will be found in a herd: Spot, .18 per cent.; Blue Bell, .11; Artis Kassie, .13; Dairy Queen, .21; Nellie, .57; Patience, .44; Joan, .35; Lisgar's Rose, .0; Cherry, .55; Old R., .66; Artis Kassie's 2, .40; Alvo, .45.

The range is all the way from nothing in the case of Lisgar's Rose to .66 in the case of Old R., a grade cow.

Amounts of Butter Produced by Two Groups of Cows.

Two groups of cows were selected, which varied widely in the per cent. of fat in their milk.

Group I. consisted of two cows, whose average test for the 3½ days during which the milk was set was 4.89 per cent fat. During this time they gave 139 pounds of milk, which made 8.38 pounds of butter. The loss of fat in the skim-milk was a "trace" in every case. The butter was firm and nice.

Group II. (three cows) gave during the same time 199 pounds of milk, with an average of 2.84 per cent. fat. This milk made 6.78 pounds of butter. The loss of fat in skim-milk was .26 per cent.

This shows the importance of having cows tested. The first group produced more butter on much less milk than did the second group. *Quality as well as quantity determines the value of a cow.*

Shallow Pans—24 and 36 Hours.

Experiments were made to determine the length of time for cream to rise on shallow pans, and whether there was any advantage in allowing the milk to stand 36 hours as compared with 24 hours. The following table gives the percentage of fat left in the skim-milk at the end of each period :

—	Oct. 6.	Oct. 7.	Oct. 8.	Oct. 11.	Oct. 12.	Nov. 26.	Average.
24 hours	0.7	0.4	0.4	0.5	0.3	0.4	0.45
36 hours	0.4	0.6	0.3	0.5	0.3	0.5	0.43

There is apparently no gain in creaming by allowing the milk to stand 36 hours as compared with 24. In explanation of the two cases where there was more fat at the end of 36 than 24 hours, we can account for it only by assuming that the skimming was not done so completely. It is somewhat difficult to get *all* the cream off shallow pans, and when the milk from a number of pans was mixed together before taking samples, a little cream on the edge or floating on top of each pan would make the difference noted.

Cream Measurement on Deep Pail after Setting 12, 24, 36 and 48 Hours.

That cream is an unknown quantity it is quite difficult to convince some people. What goes by the name of cream in some places would not pass for much more than good whole milk in others, and still some persist in determining the value of milk by the cream which rises on it. Again, the inadvisability of paying for cream according to inches is seen when we consider that an inch of some kinds of cream will make 50 per cent. more butter than others As a rule, the colder the temperature at which the cream rises, the less rich in fat will it be ; but it does not follow that poorer results are obtained. The colder the temperature in which milk is set in deep pails the lower will it test, but the more inches of cream will there be on the same quantity of milk, other things being equal. Ten inches of cream testing 80 per cent., is equal to 5 inches testing 160 per cent., and the former will make better butter, other things being equal. Hence we see the folly of patrons of cream-gathering creameries clamoring for a high test, whereas by using plenty of ice water around the cans a thinner cream is obtained, but there will be more of it than where no ice or cold water is used.

Another thing somewhat perplexing to some is that apparently there is less cream on the creamer or deep pail at the end of 24 hours than at 12 hours, and less in 36 than 24. The explanation of this is that the skim-milk settles down out of the cream, and as a con-

sequence the cream becomes more dense. There would be as much butter-fat, or possibly more, at the end of 24 than 12 hours. What this decrease is likely to be may be seen from measurements taken in trials at the dairy. The cans used were the ordinary deep pails, about 8½ inches in diameter, and were skimmed at a temperature varying from 39° to 46°.

Trials.	Inches of cream in.			
	12 hrs.	24 hrs.	36 hrs.	48 hrs.
1st	3⅜	2⅞	2⅝	
2nd	3¼	3	2⅞	2¾
3rd	4⅛	.....	.....	
4th	3⅝	3⅜	.....	
5th	2⅜	2¼	2 1/16	
6th	3⅞	3½	3⅜	
7th	2½	2⅜	2¼	
8th	3½	3⅜	3¼	
9th	3¼	3⅛	.....	

The average shrinkage appears to be from ⅛ to ¼ of an inch during the second 12 hours, and about ⅛ inch for each 12 hours after that up to 48 hours.

Milk Set in Shallow Pans in Warm *vs.* Cool Temperature.

Having been told a number of times while out with the Travelling Dairy, and on other occasions, that as soon as the weather becomes cold it is necessary to bring the pans of milk into a cupboard, or pantry, near the fire, to keep them warm, in order that the cream may rise, and knowing that this is a common impression among those who make butter, we tried a few experiments to see whether this is the case. Though of the opinion that it was not necessary to keep milk warm for the cream to rise on shallow pans, and having expressed myself so several times, yet the knowing ones always said it was wrong. This conclusion was reached by reasoning that if a cold temperature gave best results in deep setting, why would not the same effects produce equally as good results with the shallow setting? I thought it would, and I am more strongly convinced now after the experiments here noted.

The plan of conducting the experiments was to mix the milk and then put one-half in pans, and set them on a rack in the basement of the dairy, where the temperature ranged from 43° to 50°. The other half was put in pans, which were set in the working room of the dairy, where the temperature ranged from 48° to 75°. This room would resemble somewhat the variations in temperature such as occur in a farm pantry or cupboard, being coo ed down at night, and the temperature rising during the day. In the basement the temperature was more constant, and is similar to that of a farm cellar or milk house where no artificial heat is used.

In 13 trials, where the average temperature of the milk when skimmed was 56°, the per cent of fat in the skim-milk was .38, and in 12 trials, where the average tem-

perature was 46° when skimmed, the average per cent. of fat in skim-milk was .28. Except the first, second, eleventh and twelfth trials the colder temperature gave best results.

Date.	Warm temperature.							Cool temperature.					
	Lb. milk.	Temp. set.	Per cent. of fat in whole milk.	Temp. when skimmed.	Per cent. of fat in skim-milk.	Temp. room.	Hours set.	Lb. milk.	Temp. set.	Temp. when skimmed.	Per cent. of fat in skim-milk.	Temp. of room.	Hours set.
		°		°		° °			°	°		°	
Nov. 6, p.m....	15	86	.....	56	0.2	57 to 75	36	15	86	47	0.3	47	36
" 7, a.m....	20	88	3.9	60	0.2	60 " 75	36	20	88	48	0.3	47 to 50	36
" 7, p.m....	21	90	3.7	57	0.4	53 " 68	36	21	90	48	0.3	47	36
" 8, a.m....	20	88	3.4	62	0.6	57 " 68	36	20	88	49	0.4	49	36
" 8, p.m....	23	89	3.8	57	0.5	54 " 68	48	23	89	48	0.3	48	36
" 9, a.m....	20	86	.....	52	0.4	50 " 66	48	20	86	43	0.3	43	48
" 9, p.m....	18	89	3.9	52	0.5	52 " 65	36	18	89	43	0.2	43	36
" 10, a.m....	20	84	3.8	56	0.3	52 " 65	48	20	84	46	0.1	46	48
" 16, p.m....	12	85	3.7	52	0.2	48 " 75	36	12	85	47	0.15	46	36
" 17, a.m	23	84	3.3	60	0.4	48 " 71	36	23	84	46	0.1	46	36
" 17, p.m....	12	90	3.6	54	0.4	50 " 72	36	12	90	45	0.5	46	48
" 18, a.m....	10	81	2.3	60	0.4	50 " 72	36	10	81	45	0.4	45	24
" 18, p.m....	9	89	4.0	50	0.5	50 " 71	36	9	89	44	.....	44	36

Composite Tests.

Paying by test, according to the percentage of fat in patron's milk having been adopted by a number of our cheese factories and by most of our creameries which are operated on the separator plan, it becomes a question of great importance how to get the testing done with as little labor as possible, and at the smallest expense possible. With the view of assisting in this matter, we have been conducting composite tests during the past year, and publish the results with a hope that they may be of benefit to factorymen and others.

There are several ways of making the composite test, among which may be mentioned:

1. Measure a small quantity of milk (about 1 fluid ounce) from the patron's can each morning, and put it in a jar or bottle properly labelled with his name. This may be kept from souring by the use of about 10 grains of potassium bi-chromate, mercuric chloride and various other substances, or it may be allowed to sour and afterwards be rendered liquid by using potash or powered lye. Of these three, the bi-chromate is best, there being least risk and work. It should be put in the jar before milk is added.

2 Take a one-third sample (5.9 c. c.). Put directly into a Babcock bottle and test twice a week.

3 Take a one-sixth sample (2.95 c. c.). Put directly into a test bottle and test at the end of a week.

The bi-chromate and the pipettes were compared during the summer with the following results :

Week ending.	Average of daily tests.	Average of tests with 5.9 c. c., pip tte.	Average of tests with 2.95 c. c., pipette.	Composite jar, (bichromate.)
May 13	3.43	3.55	3.40	
" 27	3.76	3.82	3.80	
June 5	3.65	3.62	3.60	3.75
July 1	3.84	3.85	3.85	4.00
" 8	3.88	3.77	3.90	
" 15	3.82	3.87	3.75	3.70
" 22	2.96	3.02	2.95	3.00
" 29	2.93	3.05	2.85	3.00
Aug. 5	2.39	2.33	2.35	2.40
" 12	3.16	3.17	3.15	3.10
" 19	3.24	3.20	3.29	3.10
" 26	1.99	.....	2.00	1.90
Sept. 2	2.73	2.72	2.75	2.70
" 9	2.03	.....	.....	
" 16	2.28	2.20	2.10	
" 23	3.33	3.27	3.15	
" 30	2.20	2.20	2.20	
Oct. 8	2.89	2.85	2.90	
" 16	2.45	2.45	2.50	
" 23	3.07	3.01	3.10	
" 30	3.25	3.31	3.30	
Nov. 6	1.32	1.30	1.30	
" 13	3.96	3.95	3.85	
Averages, leaving out the tests of Aug. 26, and Sept. 9	3.073	3.072	3.045	

We found a very close agreement between the average of the daily test for six days and the per cent. of fat as found by using the pipettes, and also the composite jar in those cases where it was compared with the other three methods. It is evident that testing patrons' milk every day cannot be done in a factory where there is so much work for the makers. Of three plans already mentioned, there is less work in using a $\frac{1}{6}$ pipette as at the end of a week the milk is ready to have the acid added—no measuring, or shaking of the milk is necessary. The chief objection to this plan is that the amount of milk taken being so small the liability to error through not obtaining a representative sample, is very much multiplied. The experiments noted indicate that an average reading with the one-sixth pipette is lower than the average of daily samples, or the average of the one-third pipette.

Composite Tests for a Longer Period Than one Week.

Even where testing but once a week is the custom, makers find that on testing day (usually Saturdays) they are very much crowded with work, and it is usual to get some extra help on that day.

To see if this work could not be lessened still more we have been keeping composite samples for a number of weeks and comparing the tests at the end of 1, 2, 3, 4, 5, 6, and 7 weeks, with the average daily samples. If accurate results can be obtained by this method it would save a great deal of labor for the maker and secretary of the factory. In addition it would effect a saving of acid, wear of machine, and risk in breakage of bottles and measures.

To have a check on the work, not one jar but four jars were used, a sample being put into each one and a sample tested each time milk was put into the jars. The results are as follows:

Date.	Jar No. 1.	Jar No. 2.	Jar No. 3.	Jar No. 4.	Average per cent. fat in 4 jars.	Average of daily tests.
1st trial.						
Week ending—						
August 12	3 20	3.20	3.20	3.20	3.20	3.16 for 1 week.
" 19	3.05	3.00	3.00	3.05	3.02	3.20 " 2 weeks.
" 26	2.60	2.70	2.60	2.65	2.64	2.79 " 3 "
September 2	2.70	2.60	2.70	2.60	2.65	2.78 " 4 "
" 9	.....	2.50	2.50	2.50	2.50	2.63 " 5 "
" 16	.....	2.55	2.30	2.50	2.45	2.57 " 6 "
" 23	.....	2.60	2.60	2.60	2.60	2.68 " 7 "
2nd trial.						
Week ending—						
September 30	2.20	2.30	2.20	2.20	2.22	2.20 for 1 week.
October 8	2.60	2.60	2.55	2.55	2.57	2.54 " 2 weeks.
" 5	2.60	2.60	2.55	2.60	2.59	2.51 " 3 "
" 22	2.80	2.75	2.80	2 80	2.79	2.65 " 4 "
" 29	2.90	2.90	2.90	2.85	2.89	2.77 " 5 "
November 5	2.45	2.50	2.50	2.45	2.48	2.53 " 6 "
" 12	2.75	2.75	2.75	2.75	2.75	2.73 " 7 "

It will be noticed that not only do the tests from the four jars compare very closely with each other (duplicate tests in every case) but the average of the four jars compare very closely with the average of the daily tests. These jars were tested at the end of every week and the average of the daily tests taken for the same period for comparison. For instance, on October 22nd, average per cent. of fat found in the four jars was 2.79, milk having been added every day for four weeks previously. The average of the daily samples for the same four weeks was 2.65, a difference of less than two-tenths of one per cent. The widest difference in any week or period of weeks was less than .2 of one per cent.

The samples were kept liquid by the use of bi-chromate of potash. These samples were kept in two quart gem jars sitting on a table in the working room with no extra precaution to keep them sweet. The only thing that was done, was to keep adding a little more of bi-chromate to any sample that had the appearance of turning sour. Usually a little of the preservative was added to each jar at the end of every 8 or 10 days during the four weeks. This was sufficient to keep the samples liquid during the seven weeks of the hot weather.

In making this test for a month, which is about the time for which factories settle with patrons, for milk delivered, the following points need to be observed :

1. See that the jars or bottles are thoroughly cleaned out each time before adding milk.

2. Put in about as much bi-chromate as will lie on a ten-cent piece before any milk is added, then add a small quantity every 8 or 10 days afterwards as a preventive to souring.

3. Take out a *measured* quantity from each patron every morning ; (a dipper having a lip and holding about one fluid ounce is suitable).

4. Shake the composite sample each time after adding more milk, in order to mix the cream with the milk. Care is needed that samples are not shaken too much as they will thus be churned, when a proper sample is impossible.

5. In case a sample becomes sour, add a small quantity of powdered lye to render it liquid, test at once, record test, and then empty jar and continue again until test closes. Take the average of the two tests as the per cent. of fat for the month.

6. Before testing, set the jar in warm water (125° F.) for about one minute, which will loosen the cream, then shake and measure with pipette.

7. If the readings are not clear, add water to the neck of the bottle, whirl, then fill up with hot water, and whirl again.

Experiments in Cheese.

So far our experiments in cheese-making have been very few owing to a scarcity of milk, as previously noted. To carry on this work successfully it requires considerable milk. This we have not had except during the dairy school and this is not a favorable time to do experimental work as the students take most of our attention. We did, however, conduct a few experiments, some during the dairy school and some during the summer. Those during March were under the supervision of Mr. A. T. Bell, instructor in cheese-making. He reports as follows :

First to satisfy ourselves as to draining curd. Some advocate leaving considerale moisture in curd and salting heavier. We carried on those experiments for about a week, and the conclusions arrived at are, that the medium is the most desirable, i.e., those curds which were stirred every day and salted light and those which were left moist and salted heavy, were not so good as those between, although one made on the 8th, which was drained very dry and salted light was a very fine cheese. The "sheepskin process" was tried, which I do not condsider any advantage. Then again, we salted some before ey were sufficiently matured, and filed up afterwards as some recommend, and I found that on comparing them with others made from same milk in the usual way, deficient in body and texture when examined at the end of March, but a month later there was not that difference. However, I would not advocate that as a plan to pursue."

A cheese made by Mr. L. Patton, one of our dairy students, is somewhat interesting. This was made on March 16 from sweet milk. Rennet was added (10.16 a.m.) at the rate of 3 oz. per 1,000 lb. milk. The curd was dipped sweet, and when ground at 4.30 p.m., the hot-iron test showed about $\frac{1}{8}$ of an inch of acid. It was salted at 5.30, put to press 15 minutes later, pressed for 20 hours, and the 300 pounds of milk made 29 pounds of green cheese. This cheese was kept in the curing room for about 1½ months at a temperature of about 70°, when it was boxed and taken to a cool place. At the present writing, (Nov. 21st) it is a fine eating cheese. It was somewhat tough at first and is only now beginning to "mellow down." A buyer who examined it a few days ago, said this cheese would keep for another year.

Experiments were also made with different quantities of rennet to see the effect on the "curing" of the cheese. Rennet at the rate of 2, 4 and 6 ounces per 1,000 pounds of milk was added, and the other processes of making carried on the same with each cheese.

Experts who examined these cheese at the end of about a month, not knowing how they had been made, declared the cheese, where 6 ounces of rennet was used, a "ripe" cheese, and the others less so as the amount of rennet decreased. In the language of one of them, "this cheese (the 6 oz.) will be rotten before this (the 2 oz.) is ripe"

During the month of July some experiments were made at the dairy by Mr. T. B. Millar, Inspector of Western Dairy Association, to determine the influence of rich, normal milk on the quality and yield of cheese, as compared with poor normal milk. These experiments confirmed those reported by others, that the richer milk gives an increase of cheese. We hope to do more work in this connection when we have an increased supply of milk at our command.

In the months of July and August, I made a number of fancy cheese. These will need to be kept for some time before they can be judged satisfactorily and we refrain from giving details at present.

To show students what skim milk-cheese would be like, I took 300 lb. of skim milk testing three-tenths per cent. of fat and made it into a cheese. Some time ago, a buyer attempted to "bore" this cheese and failed. He said it was the first time he ever was stuck in trying to bore a cheese. This cheese is so hard that it is almost impossible to get a sample from it. Talking on this point a few days ago to a man who buys consid rable cheese, he said that a certain factory had a number of skim cheese and wished him to buy them. He went to see them and said he, "The whole lot is not worth ten cents."

Two cheese were made in August which had cream added to whole milk. In one case there was 29 pounds of cream added to 231 pounds of whole milk, which made 27½ pounds of green cheese. There was a loss of .4 of one per cent. of fat in the whey. The milk and cream tested 5 55 per cent. fat. The other cheese was made from 202 pounds of milk and 31 pounds of cream. There were 27¼ pounds of green cheese. Whole milk and cream tested 5.95 per cent, and whey .25. Both of these cheese have been pronounced excellent by persons who have tested them. They are soft, creamy, rich and will spread on bread.

There is room for the sale of a number of fancy cheese in towns and cities of Ontario. I receive inquiries from commission men who wish to handle fancy cheese and for those who will take the trouble to make them of good quality, it will be found to be very remunerative.

Effect of Food on the Per Cent. of Fat in Milk.

This year our experiments have taken a different line from the two years previous. Beginning May 22nd while the cows were still in the stable a composite sample was taken from each cow for a week. On May 29th 15 cows were turned out to pasture, one group (8 cows) receiving practically no meal (except 1 lb. bran each day to induce them to come into their stalls) while the other group (7 cows) received a ration of

1 lb peas, 1 lb wheat, and 1 lb bran during 1st week.
2 lb " 2 lb " " 2 lb " 2nd "
3 " " 3 " " " 3 " " 3rd and 4th weeks.

This was continued for four weeks when the ration for group II was changed to :

1 lb cotton seed meal, 1 lb linseed cake, and 1 lb bran, during 1st week.
2 lb " " 2 lb " " " 2 lb " " 2nd "
3 " " " 3 " " " " 3 " " " 3 rd and 4th weeks.

Group I. at the end of four weeks, was fed the peas, wheat and bran ration which group II. had been getting. Beginning July 25th, this group was again changed to a ration of green peas and oats, they being fed all they would eat up clean for two weeks, while group II. still continued to receive the cotton-seed, linseed and bran ration of the 3rd and 4th weeks. The results are seen in the following table :

TABLE showing per cent. of fat in each cow's milk during the several periods.

Group I. Eight cows.

Week ending	Duchess.	Nellie.	Patience.	Anna.	Fort.	Rose.	Joan.	A.K. Queen.	Rations fed during the different periods.
May 28 (previous to expt)	3.3	3.0	3.4	3.5	3.9	4.8	3.2	3 0	1 bus. roots, 20 lb hay, 4 lb. bran, 4 lb. ground wheat.
1st period — June 4.	4.8	3.1	3.95	5.1	4.3	5.85	3.7	3.0	Pasture and one pound bran daily to each cow
" 11..... ...	4.2	3.85	4.25	3.8	4.6	5.40	3.8	3.4	
" 18.	3.7	3.1	.....	4.3	4.1	4.7	3 0	3.2	
" 25....	3.78	3.37	3.63	4.25	4.32	4.98	4.19	3.13	
Average of last 3 weeks.	3.89	3.44	3.94	4.11	4.34	5.02	3.66	3.24	
2nd period—									Bran. lb. / Peas. lb. / Wheat. lb.
July 2	3.2	3.3	3.85	4.05	3.70	4.45	3.25	3.20	1 / 1 / 1
" 9	3.7	3.6	3.6	4.0	4 6	4.7	3.5	2.6	2 / 2 / 2
" 16	4.0	3.6	3.8	3.9	4.0	4.7	3.6	3.4	3 / 3 / 3
" 23	3.6	3.3	3.8	4.5	4 2	4.5	3.4	3.3	3 / 3 / 3
Average of last 3 weeks.	3.76	3.5	3.73	4.13	4.26	4.63	3.50	3.1	in addition to pasture.
3rd period— August 6, last week	3.6	3.4	3.9	4.2	5.6	4.6	3.6	3 2	Pasture, green peas and oats.

Group II. Seven cows.

Week ending.	Alvo.	A. Kassie.	Cherry.	Spot.	O. R.	D. Queen.	Blue Bell.	Rations.
May 28 (previous to expt)	2.8	2.7	3.35	4.05	3.2	3.5	3.8	1 bus. roots, 20 lb. hay, 4 lb. bran, 4 lb. ground wheat.
1st period —								Bran. lb. / Peas. lb. / Wheat. lb.
June 4	3.3	2.85	3.55	4.0	3.8	2.5	3.6	1 / 1 / 1
" 11	3.6	2.8	3.6	3.3	3.7	3.0	4.0	2 / 2 / 2
" 18	2.9	2.7	3.2	3.5	3.4	2.8	3.3	3 / 3 / 3
" 25	2.93	3.05	3.77	3.41	3.18	3.37	3.62	3 / 3 / 3
Average of last 3 weeks.	3.14	2.85	3.52	3.40	3.42	3.05	3.64	The above in addition to pasture.
2nd period —								Bran. lb. / Cotton-seed meal. lb. / Oil cake lb.
July 2.....	2.80	2.5	3.2	3.1	3.2	3.4	3.4	1 / 1 / 1
" 9.....	3.3	3.1	3.2	3.5	3.3	3.0	3.4	2 / 2 / 2
" 16	3.4	2.8	3.6	3.4	3.5	3.0	3.7	3 / 3 / 3
" 23.....	3.5	2 9	3.8	3.4	3.2	3.2	3.4	3 / 3 / 3
Average of last 3 weeks.	3.4	2.93	3.53	3.43	3.33	3.06	3.5	in addition to pasture.
3rd period— August 6, last week....	3.4	2.9	3.6	3.2	3.6	2.8	3.5	Same as in second period.

Remarks. The reader's attention is called to the fact, that with but two exceptions the cows when turned out to pasture *increased* in the percentage of fat during the first week. In the case of Spot it may be said to be practically the same, and D. Queen received an injury to her udder about this time which no doubt caused the shrinkage in her case. That cows should give richer milk when turned out to grass is contrary to our expectations and the general teaching along this line, but in this case it was true, both for the group which received meal and the one which received it not.

Summary. The average per cent. of fat in group I milk for the week previous to turning out to grass was 3.51, and for the last three weeks of period 1, in which each cow in the group received but one pound of bran a day in addition to pasture, the per cent. of fat was 3.96. Group II for a week previous to being turned out gave milk with an average per cent. of fat of 3.32 leaving out D. Queen's milk, (with hers 3.34) and the average for the three weeks on pasture in which they received in addition peas, wheat and bran, was 3.33—averaging D. Queen's also, it is 3.29.

During the second period when group I received peas, wheat and bran in addition to pasture, the average fat in their milk was 3.83, and Group II, which received pasture, cotton-seed meal, linseed meal and bran, gave milk with an average of 3.31 per cent. We may say that both groups gave milk with practically the same percentage of fat during both periods.

During the last week of the third period, when Group I was changed to green peas and oats in addition to pasture, their milk averaged 4%. Group II which had same ration as during the second period averaged 4.07 %. This second group appears to have given milk which was more constant in its percentage of fat than Group I.

Added Points. For the week previous to being turned out to pasture Group I gave 1,308 pounds of milk containing 45.9 pounds of fat. The average of one week during the first period on pasture was 1,355 pounds of milk and 54.7 pounds of fat. Group II gave 1,466 pounds of milk and 48.9 pounds of fat in one week previous to being let out to pasture, and the meal and pasture produced from the same cows 1,896 pounds of milk and 62 pounds of fat in one week (average of 4 weeks.) During the second period both groups shrunk in their milk as compared with first period. Dry weather, consequently poor pasture, was the cause.

During the week when both groups received practically the same feed, Group II produced 158 pounds more milk than Group I. During the first period of the experiment, when Group II received meal in addition to pasture and Group I had only pasture. Group II gave 541 pounds more milk than Group I. This 383 pounds is probably the extra milk produced from the meal fed. The extra meal fed these cows for a week would cost about $2.25, or the extra milk was made at a cost of about 58 cents per 100 pounds.

The average weight of Group I when let out on May 29th was 962 pounds, at the close of period 1 they averaged 987 pounds. Group II averaged 1.043 at beginning, and 1103 pounds on June 26th. At the close of the second period (July 24th) Group I averaged 981 and Group II averaged 1,111 pounds.

Effect on the Per Cent. of Fat when Cows were Fed Slop.

At various times when the subject of the effect of good on the per cent. of fat was being discussed, I have been told that if you slop the cows, *i. e.* wet the meal until it is is like mortar instead of giving it to them dry, they will give more milk, but it will surely be very poor.

The following six cows were used in the experiment :

Lisgara,	calved	Aug. 21st, 1893.
Rose,	"	March 30th, "
Patience,	"	April 3rd, "
Spot,	"	Jan. 30th, "
D. Queen,	"	Feb. 28th, "
Blue Bell,	"	Apr. 11th, "

The experiment commenced Nov. 6th and closed 26th, lasting three weeks. For one week previous to the experiment composite samples were taken of each cow's milk and tested. Weekly composite samples were also taken during the experiment from each one. The first week each cow was given all the bran slop she would eat (about 14 pounds of dry bran each day). The water was cold—the same as the water drank in the stable.

The second week the slop was made of 4 pounds of bran and 4 pounds of wheat, cold. The third week same as second except that the bran and wheat were scalded and the slop fed warm. In addition to this they had about 6 pounds of hay and 40 to 50 pounds of corn ensilage each.

TABLE SHOWING PER CENT. OF FAT WITH SIX COWS BEFORE AND AFTER SLOPPING.

Week ending.	Niagara. Per cent. fat	Blue Bell. Per cent. fat	Patience. Per cent. fat	D. Queen. Per cent. fat	Rose. Per cent. fat	Spot. Per cent. fat
Nov. 5th (no slop.).....	4.55	4.20	4.50	3.30	5.30	3.90
Nov. 12th (bran slop.)	4.40	3.80	4.50	3 20	5.60	3.40
Nov. 19th, bran and wheat slop (cold.).....	4.50	4.30	4.70	3.30	5.75	3.40
Nov. 26th, bran and wheat slop (warm)	5.10	4.25	4.65	3 45	6.05	3.25
Average of last two weeks.	4.80	4.28	4.68	3.38	5.90	3.33

If we take the six cows as a group their milk tested an average of 4.29 for the week previous to the experiment, 4.15 the first week after receiving slop; 4.33 the second week and 4.46 the last or third week during which they were "slopped."

Quantity. The week previous to the experiment these six cows gave 829 pounds of milk. The first week after they shrank to 755. The second week they gave 635 and the last week 615 pounds of milk. We would naturally expect these cows to shrink in their flow of milk as three of them had been milking since spring—one since February, one since January, and one had been milking since August. They shrank more, however, after the slopping commenced than before. For instance, Lisgara for the week ending October 22nd, gave 166 pounds; week ending October 29th, 167; November 5th, 165 (week previous to experiment); November 12th (first week of experiment) 150; November 19th, 132; November 26th, 134 pounds. Blue Bell for the week ending October 22nd gave 140 pounds of milk; October 29th, 158; November 5th, 156; November 12th, 126; November 19th, 110; November 26th, 116 pounds. Take one more—Spot. The week beginning October 22nd she gave 117 pounds; October 29th, 106; November 5th, 104; November 12th, 90; November 19th, 64; November 26th, 55 pounds.

This experiment would indicate that "slopping" is an expensive way to feed cows, and there need be little wonder, when the physiology of a cow is considered By feeding wet food it passes more or less directly to the third and fourth stomachs without being re-masticated as is done when the food is given dry. More experiments are needed to settle the question.

EXPERIMENTS IN FEEDING WHEAT TO MILCH COWS.

The price of wheat having reached a point where it became a question whether to sell or feed wheat the Dairy department bought some ground wheat for feeding purposes. The price, delivered at the dairy, was $20 per ton. We have been feeding quite largely of this grain during the past year and have found it wholesome and cheap food for young pigs, young calves, and milch cows.

On November 22nd, 1892, we commenced feeding a ration of 50 lb. corn ensilage, 6 lb. hay and 8 lb. of ground wheat to Rose and Milne, and the same ration with 2 lb. of wheat and 10 lb. of ensilage extra to Kassie and Alvo. This has continued four weeks.

Rose,	calved	March	31st, 1892.
Milne,	"	July	24th, 1892.
Kassie,	"	May	19th, 1892.
Alvo,	"	Sept.	20th, 1892.

During the four weeks these cows gave 2,523 pounds of milk, containing 86.79 pounds of butter-fat, which would make about 95.5 pounds of butter. At that time we were getting 22 cents per pound for butter, therefore the value of their butter for the four weeks was $21. Their feed for the same time cost $15.93 (ration cost 12 9c. per day for Rose and Milne and 15.55c. for Kassie and Alvo), leaving a profit of $5.07, not very much to be sure, but it will be remembered that three of these cows had been milking for a considerable time.

December 12th, 1892, two fresh cows were fed the same ration as Rose and Milne, viz, 50 lb. ensilage, 6 lb. hay and 8 lb. ground wheat. This was continued for three weeks, during which time these cows gave 1,212 pounds of milk, containing 50.37 pounds of butter-fat, making about 55.5 pounds of butter. (One-tenth added to the fat to calculate the butter made.) This at 22 cents per pound would be $12.21, the value of the butter for the three weeks. Their feed cost $5.42 for the same time, leaving a profit of $6.79, assuming that the manure, skim and buttermilk paid for the labor.

We would recommend dairymen to try a ration of wheat and bran, or wheat and oats during the winter and if it is fed to the right kind of cows and the product handled properly, we feel confident that it will pay better than selling wheat at present prices. Besides this the increase in the value of the manure pile will be no small item. Good feed makes good manure.

At the conclusion of the preceding experiment, the same two cows were fed for four weeks on a ration of 50 lb. ensilage, 6 lb. hay, 4 lb. bran, and 4 lb. ground wheat. The object was to see whether 4 lb. of bran would replace the same number of pounds of wheat. Bran at this time was worth $12 per ton and wheat $20.

During the four weeks these cows gave 1,424 lb. milk, 60.58 lb. butter-fat, which would make about 66.5 pounds of butter. This at 22c. per pound would be $14.63—a profit of $8.30 as the food cost $6.33 for this time, ensilage being valued at $1.25 per ton, hay, $6 and bran and wheat as quoted above.

The first ration (wheat) with these two cows gave a profit of $6.79 for $5.42 worth of feed fed, or $1 in feed gave $1.25 profit; while with a meal ration of half bran and half wheat (coarse fodder being the same in both cases) $6.33 worth of feed gave a profit of $8.30, or $1 in feed gave a profit of $1.31 in butter. At prices quoted a meal ration of half bran and half wheat gave more profit than wheat alone.

To see what error is likely made by adding one-tenth to the fat, in calculating the butter made during any period, the milk from each cow was set separately for one churning during each week of the last experiment, and the cream obtained was churned separately. In the case of Duchess there was set 16.02 pounds of fat which produced by actual churning 17.56 pounds of butter. By adding one-tenth to the fat she would be credited with 17.62 pounds of butter. Of Ontario Pet's milk there was set 19.52 pounds of fat which produced 20.81 pounds of butter. By adding one-tenth to the fat she would have been credited with 21.47 pounds of butter. Taking into consideration the average losses of fat in handling milk we have found this a fair rule for finding the amount of butter which is likely to be made from the butter-fat found in the milk.

V. TRAVELLING DAIRIES.

During this year there have been two dairies on the road. The one working in Eastern and Northern Ontario was in charge of Mr. Carlyle, a graduate of the College. The other, which held meetings in the Western and the the Northwestern part of the province, has been under the supervision of several persons. Mr. Linfield, who was in charge last year, took the work for about a month, when he resigned to take a position in Utah. Mr. George E. Day, a graduate of 1893, then assumed control, but in September he resigned, having been appointed Lecturer in Agriculture at the College. I then took charge for about three weeks, when Mr. Beckett, another graduate of this year, took the work in hand and stayed until the close of the season. For this reason so full a report of this dairy cannot be given as might be expected. I have gathered a few facts from each, which, together with my own experience, must serve as a report for this year.

The Western Dairy commenced the season in Lambton on May 3rd, and held twenty-four meetings in this county, closing at Thedford, June 5th. The attendance averaged about one hundred in the East Riding. A number of cheese factories have been established, and farmers are very anxious to go more largely into the dairy business.

In the County of Huron twenty-six meetings were held. This is a great beef-raising county. There are also a number of creameries and cheese factories. Farmers appear to have made no provision for drouth, and as a consequence there was a great shrinkage in milk during the summer and fall. This is true for most of Western Ontario. The great difference there is in cows was shown at one place, where one man had eight cows which gave twenty-five pounds more milk per day, testing from one-half to one per cent. higher than his neighbor who kept fifteen cows. Parts of Huron were not well advertised—halls not engaged, and in some places no posters. Average attendance about forty.

Bruce had thirty-three meetings. Mr. Dack, the member for Centre Bruce, assisted in arranging the meetings, and also attended several. The attendance averaged forty, but it was a very busy time for farmers from July 25th to September 7th.

In Grey there were thirty-four places visited by the Dairy. Fourteen of these I attended. At most of them the interest was good. In some places little or no provision had been made to insure success. In one the gathering was in a barn, no other suitable place being available.

The County of Grey is noted for its creameries. The land is somewhat rough and rocky in many districts visited by me, but the excellent water and pasture furnish material out of which cows may make milk of the best quality. Cream is gathered for a number of miles in all directions from the creameries. Some are joint-stock, and others managed by private individuals. In nearly every place where farmers sold cream there was complaint about the testing. Unless this can be done in a more satisfactory manner the cream-gathering creamery is bound to lose the confidence of its patrons.

A great deal of the prize creamery butter at the leading fairs comes from this county, and they feel justly proud of it. In most of the parts I should conclude that dairying is the hope of farmers. Grain-growing can never be remunerative.

I found a great deal of interest taken in the testing, but owing to the fact that the samples were not taken properly little can be relied upon the whole milk samples brought to these meetings. On making enquiries as to how the samples were taken, in a number of cases I found that persons would forget all about taking samples at the usual time of milking, and would run out to the field or stable before starting and milk out enough for a test and bring this to the meeting. They might as well, and far better, have left it home, as it was a waste of our time and a waste of materials in testing. Others would try to have a test that would "beat all creation," or at least beat any neighbor's cow, and would bring some of the cream from a cow or else some strippings. Others would bring cream to be tested, and still others would fill a big bottle about one-third or one-half full, drive several miles to the meeting, and by the time it got there it was churned into butter. This was done in spite of explicit directions as to how to take samples. The attendance was about seventy-five in Grey.

From Grey the dairy moved into Dufferin, holding eleven meetings, beginning at Corbetton, October 26th, and closing at Rosemont, November 9th.

South Simcoe was the next point. Eleven places were visited. At Beeton, in this riding, a herd of five cows was tested, which gave per cents. of fat as follows: 1.1, 1.3, 1.8, 2.0 and 2.8, the average of the herd being 1.8. The owner said the samples had been correctly taken. "He had an idea that they were not paying very well." At another place a sample, which was correctly taken, tested 9.3 per cent. fat. These are examples that should show the importance of testing the cows in the herd.

An extra meeting was held at Mount Albert, in York County, November 28th, which closed the season's work. During the time which this dairy was on the road it travelled some 1,750 miles, held 140 meetings, and 1,944 samples of milk were tested. Addresses were given at all these meetings on various dairy topics, but most stress was laid on the importance of having good cows, proper and abundant feed and water, and the various steps in handling milk until it was put up in a neat, attractive form, ready for market, was fully explained. Thousands of "Hints on Butter-making" have been distributed. The work as a whole has been appreciated by those for whose benefit it was established, and no doubt great good will come from it.

The whole province has now been covered except the counties of Peel and Halton. Every farmer has had an opportunity of attending one or more of these daily assemblies, as they were so arranged that all might have the advantage of a practical lesson in butter-making, and hear the main points connected with dairying discussed.

Whether the work is to be continued or not has yet to be decided. With your permission, I would suggest that after the two remaining counties have been visited, the work take a more permanent form, somewhat as follows: Select some half dozen places in a county which would be convenient and central to the whole, and establish a working dairy which would remain for at least two weeks in each place. Where but one meeting in a place is held some persons just begin to hear about it after the dairy has gone away, and suddenly awake to find that they have missed something. The wide-awake people are always to be found at the one meeting, and the very persons who should be there forget the date or have some important business on that day, whereas, if it lasted for two weeks, all could attend, and the benefits would be lasting. Not only would I have churning every day, but also a separator or separators, different kinds of creamers, milk testers—in fact a complete small working dairy. A programme might be arranged each day something like this:

9 to 11 a.m.—Running of separators.
11 to 12 a.m.—Explanations and discussion regarding separators.
2 to 3 p.m.—Lecture on some dairy topic. (In two weeks a clever lecturer would cover a good part of the field of dairying.)
3 to 4 p.m.—Churning.
4 to 5 p.m.—Discussion on care of cream and methods of churning.
5 to 6 p.m.—Methods of setting milk illustrated.

This might be varied to advantage, and I simply give this to illustrate my point. If any place were sufficiently interested to furnish a suitable building and a supply of milk, that place would be selected. In this way I think more permanent good would be accomplished than by short stops in so many places.

Report of Mr. Carlyle.

To Prof. H. H. Dean:

Sir,—I have the honor to submit the following brief report of my work with the travelling dairy for the season of 1893.

In accordance with your advice, as well as that of Dr. Mills, I took the course at the Dairy School last February and March, from which I derived great benefit, and which assisted me very materially with my work during the past season.

After the Dairy School closed I got ready the outfit for both travelling dairies, so that when we left Guelph on the 26th of April to begin our work we had two very creditable outfits, which were practically the same as those used last year. I also had as

my assistant and butter-maker Mr. J. A. McTavish, of Seaforth, who had spent the preceding season with the travelling dairy in company with Mr. Palmer. It is with pleasure that I now speak of the invaluable services rendered by this gentlemen. Always giving his work close, careful attention, and going through the different operations in such a skilful, deft manner as always impressed the ladies present with the importance of neatness and cleanliness in their dairy work.

During the year we visited and made a tour through the counties of South Ontario, Durham, Peterborough, Muskoka, Parry Sound, Algoma with Manitoulin and St. Joseph's Islands, Victoria, Haliburton, North Ontario, and Simcoe. We travelled altogether during the season 2,409 miles, held 132 meetings, delivered the same number of lectures, tested 2,350 samples of milk, of which 202 were buttermilk and fifty-one were skim milk. We churned 3,855 pounds of cream which made 987 pounds of butter, or about 3 92 pounds of cream required to make one pound of butter. Two meetings were advertised for but were not held. One was in Peterborough county, at Ennismore, when neither cream nor audience put in an appearance, and the other was at Manitowaning, on Manitoulin Island, where, on account of rough weather on Georgian Bay, we were unable to get in time for the meeting.

The arrangements for the meetings in each riding were all made previous to our visit by an agent sent from the College to consult with the officers of the different farmers' institutes, and with the members of the Ontario Legislature, where there were no institutes organized. This we found very necessary, as without it our route would not have been nearly so well mapped out for us nor would the meetings have been so well advertised.

We left Guelph on the 26th of April and drove to Pickering, in Ontario county, where our first meeting was held on the second day of May. We held twenty-two meetings in this county, being so distributed that one meeting at least was within reach of any farmer who wished to attend. We had an average attendance of about eighty persons, the majority being ladies, and although they often came to the meetings strongly prejudiced against us, it was very gratifying to us to find that in nearly every case the prejudice was due to a mistaken idea of the object and plan of the meetings. There were 382 samples of new milk tested, showing an average of 3.6 per cent. butter-fat; 15 samples of buttermilk with an average of 0 41 per cent. fat, and 8 samples of skimmed milk showing a loss of 0.92 per cent. of the butter fat: the lowest test for skim-milk in this county being 0 3 per cent. and the highest 3 0 per cent. The farmers of this county have been slow to turn their attention to dairying, many of them expressing the opinion that their land was too good to devote it to such a purpose. Stock-raising and grain-growing has been the almost universal custom. The class of milch cows where such are kept, are those from which highest success in exclusive dairying cannot be expected. I found, however, a growing interest in the dairying industry. Cheese factories and creameries are slowly being established. They also place their main reliance for succulent food in the winter time on turnips instead of corn ensilage, which would be likely to improve the quality of the butter as well as being more profitable.

We next visited Durham county, where 18 meetings were held with an average attendance of about 70, the largest being over 200 and the smallest about 25. There were 312 samples of new milk tested, 6 of skim-milk with an average of 0.75 per cent. of fat lost, the highest being 2.0 per cent. and the lowest a mere trace, also 12 samples of buttermilk containing an average of 0.77 per cent. of fat, the highest being 2.5 and the lowest a trace. The farmers here were in some sections going into cheese factory work quite extensively. We visited the several cheese factories in the county, and found them all proving highly satisfactory where they were receiving the hearty support of the farmers. Durham county we considered one of the best visited for grazing cattle and co-operative dairy work. It is supplied with an abundance of pure fresh water from the spring creeks running through almost every section of the county. The land is rolling and well-adapted to the growth of grasses, clovers, corn, peas and roots. The storekeepers and other dealers in butter in the county complain bitterly of the turnip flavor of

the butter made; also the bad flavors derived from musty cellars and other unsuitable places of storing the butter. One mare in our team proving in foal we found it necessary to effect an exchange, which we did, acting under the advice of Dr. Mills.

From Durham we passed into Peterborough county, which has made rapid progress in dairying during the past few years, especially in cheese-making. We held 18 meetings here, with an average of about 60 persons present. Allowance must be made, however, for the fact that most of the farmers were busily engaged with their haying operations or the average would probably have been much larger. One hundred and fifty-six samples of new milk were brought in for testing, 18 of buttermilk with an average of 1.1 per cent., the highest being 7.0 per cent., the result of mixing three different lots of cream in the one churning, two of them being sweet and the other one ripe. Had 7 samples of skim-milk averaging 0.5 per cent. of fat, the highest being 1.0 per cent. and the lowest being 0.3 per cent. At Ennismore was the only instance all summer where a meeting was not held on account of no attendance of farmers. The county we found well adapted for dairying purposes. In the northern part especially it offers greater natural facilities for this than for any other branch of farming. The people of this part of Peterborough, we found, were taking a deep interest in dairy work although laboring under great disadvantages in the form of poor buildings, poor stock and a long distance from a good market. In the southern part of the county we were surprised at the number of acres still devoted to the growing of fall wheat and as a consequence a general feeling of discouragement among the farmers at the hard times.

We next visited Muskoka, leaving our horses and waggon behind in Peterborough, when the horses were turned out to pasture. Our travelling consequently had to be done by railway, steamboat and an occasional livery conveyance. This of course entailed a vast amount of discomfort and night travelling, which, however, was compensated for in the pleasures to be derived from a trip through these "Highlands of Canada" in the summer season. We held 8 meetings in Muskoka district, with an average attendance of about 100. There were 155 samples of new milk tested with an average of 4 25 per cent. of fat, 8 samples of buttermilk with an average of 0.54 per cent. of fat. On several occasions farmers walked 13 miles to the meetings, carrying with them samples of their cows' milk to be tested.

This county, as is well known, is very much broken with rock, but where there is land it is very fertile and is well adapted to private dairying. Co-operative work will never, perhaps, be very successful here as the population will always be scattered and good roads at a premium. The climate in summer, the water, and sweet rich natural grasses leave nothing in these respects to be desired for those wishing to engage in private dairy work.

From Muskoka we proceeded northward along the railway line through Parry Sound district, where we held 12 meetings. These, with one or two exceptions, were very largely attended and a deep interest was manifested. The country was not so rough and rocky as we proceeded northward, and a point of interest perhaps was that the quality of the milk increased perceptibly, chiefly owing, I believe, to the abundant rich succulent pasturage and also to the splendid climate. Two hundred and seventeen samples of new milk were tested, showing an average of 5.54 per cent. of butter fat, the highest test being 7.4 and the lowest 3 0 per cent. We also tested 10 samples of buttermilk, showing an average of .73 per cent. fat, the highest being 2.6 per cent. and the lowest, .2 Six samples of skim-milk tested 0.4 per cent. fat. One of these was from shallow pans left sitting in a good place until sour, showed 0 6 per cent.; 3 were from "Cooley cans" set in cold water 12 hours (no ice used), average per cent. fat 0.6; one sample set in Cooley cans 24 hours with water changed 3 times, 0.1 per cent. fat and one sample from centrifugal separator tested 0 1 per cent. fat.

As in Muskoka, we found these farmers taking a deep interest in dairying, suitable markets being their greatest drawback; they were greatly impressed with the plan of putting the butter up in pound prints and shipping while sweet and fresh to the thriving railroad and mining towns of North Bay and Sudbury, where good prices could always be obtained for a good product.

We noticed a marked improvement in the country lying to the south of Lake Nipissing. Some of the finest grain growing and grazing farms I have ever had the pleasure of visiting are to be found in the South River Valley in the immediate vicinity of the village of Powassan. This land is so remarkably cheap and of such virgin fertility that it offers exceptional advantages to enterprising young men with a little capital. In the Magnetawan River Valley are found some very fine farming lands also.

From Parry Sound harbor we took the boat for Manitowaning, on Manitoulin Island, but on account of rough weather we were unable to make the port in time for the meeting which caused a great deal of disappointment, as some farmers had driven over thirty miles to attend. Only two other meetings were held on the Island, which were largely attended and a lively interest taken. We found abundant evidence of severe drouth here, which was entirely absent just across the channel on the mainland, which can largely be accounted for from the fact that the Island is of limestone formation while the mainland is of granite and seems to hold the moisture obtained from the heavy dews which fall every night.

Five meetings were held on the mainland of Algoma, which were largely attended, as were also the two meeting we held on St. Joseph's Island, where we were greeted with immense crowds and a very prosperous people. From what we saw of this small Island it has exceptional facilities for dairying purposes which the farmers are not slow to take advantage of. While in Algoma we tested 168 samples of new milk, seven samples of buttermilk and three samples of skim-milk with an average of 1.1 per cent. fat lost in it. Several small sections of Algoma we found to consist of excellent farming lands and the people appeared very well-to-do and seemed happy, contented and prosperous

From Echo Bay, near Sault Ste. Marie, we took the train for Omemee, in Victoria county, when we commenced travelling with the team and wagon again. The horses we found in splendid trim after the good rest they had been having, and which did their feet a great deal of good. We found the farmers of Victoria county still putting their main dependence in the growing of grain for sale, in the feeding of beef and also in some sections the growing of immense crops of potatoes for which the soil is especially well adapted. The major portion of the stock kept is of such a character as will never prove highly remunerative for purposes of dairying In this county a person travelling through could scarcely fail to be impressed with the fine farm buildings and stables to be found in the southern part of the county especially. If the farmers there could only be induced to go into winter dairying with a better type of dairy cattle their success would be assured, as their farms and buildings are well adapted for such a purpose. We held sixteen meetings in Victoria which were very well attended, and the people in some places showed quite a desired tendency towards the dairying interests. There were 216 samples of milk brought in to be tested.

In North Ontario the conditions were much similar to those in Victoria county, but the farmers in general evinced a much more lively interest in dairying, which was attributed to the previous visit of the travelling dairy two years ago. The county was perhaps more level than Victoria, and has a heavier soil, especially that portion bordering on Lake Simcoe. Ten meetings were held in this riding which were very largely attended especially in those places where meetings had been held two years ago.

We next passed round Lake Simcoe and into the east riding of Simcoe county by way of Orillia. The meetings had not been well advertised here, nor had they been well managed, so that the results were not nearly as favorable as they might otherwise have been. The average attendance was not above forty-five persons, which was the lowest during the whole season, and only 125 samples of milk were tested. In centre and west Simcoe our meetings were very successful and very well arranged indeed; the attendance was large and and the interest well sustained. Silos and corn-growing were subjects of great interest among the farmers, and a cheaper production of milk is being sought after.

Plan of the Meetings.

We usually did our driving, which averaged about twelve miles per day, in the forenoon, reaching the place of meeting in time to get utensils unloaded and set up in the hall before dinner. In some places we had great difficulty in finding out where the meeting

was to be held, no hall or other building having been provided. We usually went to the hall or school-house, as the case might be, about 1 o'clock and made ready for the churning and milk testing. On only one or two occasions during the whole season were we able to commence the meeting at the time appointed, the people usually being about one-half to three-quarters of an hour late. We usually had a chairman appointed who opened the meeting with a few suitable remarks, after which Mr McTavish proceeded to churn the cream, which had previously been brought to the proper temperature. I found it necessary first of all to explain the nature and the object of our meeting. It was surprising the number of different opinions we heard expressed regarding the nature of our work among the farmers. Some thought the butter was to be made without cream; some that we had some new "patent" process and were trying to sell the right; others that we were advertising the different utensils used, while very few came with a right impression of what our object really was. After correcting these views as much as possible I proceeded to explain each part of the work in connection with the churning as they came up, inviting at the same time any questions that might occur to anyone in the audience. We began churning the cream at a temperature of 62 degrees F. in the spring, always varying it a little as we thought the existing circumstances as to the temperature of room, quality of cream, etc., demanded. In the summer months we churned at about fifty-seven and then gradually rose until in November we churned at sixty-four degrees. We aimed to have the butter break in about twenty-five minutes, but found that the different qualities of cream often demanded a marked change of temperature to bring the butter in in the same conditions in the same length of time in churning. While the churning was proceeding the chief points of interest in the different methods of creaming the milk, the handling of the cream, feeding, watering and general management of cows were touched upon and discussed. When the butter broke the attention of the audience was directed to the method employed in removing all the butter-milk, the salting of the butter, and the importance of using good, pure salt that would be easily dissolved. Then followed the working, packing or printing and marketing of the butter, as they each came up. A small leaflet containing "Hints on Butter Making" was distributed, after which the

Babcock Test

was brought forward, and the manner of making a test fully explained, besides testing any samples of milk that were brought in for that purpose. The men, especially, manifested a deeper interest in this operation than in any other part of the proceedings. The importance of this test and the immense benefit to be derived from the intelligent use of it in private dairy work was seen at once when two bottles showing a wide difference in the percentage of fat were displayed and explained to them. The manner of testing a cow's milk throughout the season was touched upon as well as the importance of disposing of the poor cows at once; also the easy and accurate manner in which they could determine the effect on the milk of the different food rations fed. We also tested the buttermilk every day, and pointed out the importance of occasionally testing the skim and buttermilk so that any serious loss might be detected and the system changed or remedied so as to check such loss at once. If the different samples of skim-milk brought in to be tested were any standard to judge from, then this loss of butter in the skim-milk is a most serious one. We found that taking the average there was over 1.0 per cent. of fat in the milk lost in this way, which makes it a very serious loss when we reflect on the fact that the new milk did not test over 4.0 per cent. on the average. If the Babcock tester did nothing else than to check this loss it would be worth many times its cost price to the farmers af Ontario. The system of paying for milk furnished at cheese factories and creameries on the basis of its fat contents as shown by this test met with universal favor, cheese factory patrons being especially strong in advocating its adoption at once. We found a marked increase in the percentage of fat in the milk as the period of lactation in the cows and the season advanced. In May, the average of all the milk tested was 3.6 per cent., in August it was 4.9, and in November it was about 5.5 per cent.

The greatest need the farmers have was, in our judgment, an increased knowledge of the fundamental principles that underlie permanently profitable dairy work. With this would come at once the revolution that is so much needed in the feeding and manage-

ment of our dairy cows. Too many farmers are crying for a better breed of cattle, when if the dairy cows of this province could be understood it would be found that nine-tenths of them would be crying in thunder tones, "Give us a better breed of dairymen before you condemn us." Without good feed and good care a good cow will very soon become a very poor one, and a great many of our so-called poor cows would surprise some of their owners were they only to receive a little more liberal treatment. There is a strong tendency in all animal life to either climb up or come down to the level of its environment. It is much more needful in my estimation to get the farmers to improve their methods of feeding and caring for the dairy cows they already have than to induce them to get a better breed. Good breeding is all right, but without good feeding and good management it is useless. From my experience among the farmers of the province I would much prefer a good common cow with no particular breeding and have her properly kept, than to have a cow with the best breeding and the best pedigree in the country without good feed and good care. Get the dairyman right first and he will soon produce the right cow. We did not find one farmer in seventy-five who made any provision whatever for supplemental green food for their cows when the pastures fail, as they most invariably do in the latter part of the summer season A few acres of green peas and oats followed by a few acres of corn sown every year on every dairyman's farm would soon do much toward lessening the number of unprofitable dairy cows in this province. When a dairy cow once loses the "flow" of her milk it is almost impossible to bring her back to it again.

There is also great need for better buildings both for stabling the cattle and for providing a proper place to manufacture and store the butter as well as proper utensils to manufacture the product with Without a suitable place for keeping milk and cream, etc., and proper utensils, good butter cannot always be produced no matter how efficient the butter-maker may be. For this reason, and for many others that might be enumerated, I always strongly advised the establishment of creameries or cheese factories, or better still a combination of these, where a sufficient quantity of milk could be obtained within reasonable distance to make the venture successful financially to the operator and proprietor. The centrifugal system of creaming milk was always explained and highly recommended where it could be practiced both in private dairies and in creameries. The advantages of winter creameries were also touched upon and the system advanced as much as possible. I also noticed where successful meetings had been held by you in connection with the travelling dairy of two years ago that we were always greeted with a much more intelligent appreciation of our work and abundant proof of a largely awakened interest in all branches of the dairy business, and in some instances in these places we were almost overwhelmed with questions from those who had benefited by the preceeding visit and were anxious for more light on the subject.

In conclusion I would like to say a word in appreciation of the valuable service rendered by the officers of the different farmers' institutes, members of the Legislature, and others who by their interest and zeal in advertizing the meetings assisted so materially in the success of our work. And on behalf of Mr. McTavish and myself I would like to take this opportunity of expressing our hearty thanks for and deep appreciation of the kindly, whole-souled hospitality extended to us by the farmers of this midland and especially of the northern district which we had the pleasure of visiting. All of which is respectfully submitted.

Your obedient servant,

W. L. CARLYLE.

VI. MISCELLANEOUS.

DAIRY MEETINGS.

Though relieved altogether from the regular farmers' institute work I attended and took part in the annual conventions of the three Dairy Associations of the Province during the month of January. Besides these I have attended a number of extra farmers' and dairy gatherings in various districts throughout Ontario. As a result of these meet-

ings several factories have been started and assistance given in various ways. A number of travelling dairy meetings were attended by me, and addresses given in addition to the regular lecturers. I also took charge of each of the dairies for some time in the absence of the regular men.

Correspondence.

During the year a great many letters came to the department, and the task of answering all these is not a small one. In addition to the business correspondence in connection with the Department, a number of queries are given, some of which require considerable time to answer. We are glad, however, to give help in this way, and any who have a *real* difficulty it will be a pleasure to assist. As an example of the foregoing we append the following questions and answers :

Queries Regarding Paying According to Test at Cheese Factories.

Question 1.—"At our annual cheese meeting one of the patrons asked me, if he kept part of his milk at home and sent the cream of it to the factory with the rest of his milk, did it make any difference to the rest of the patrons that were sending? Was it cheating himself or the other patrons by him sending the cream of that pool and keeping the skim milk at home, as he could feed it to calves and hogs? I would be pleased if you would answer the question for me, as I am going to pay according to butter-fat at both my factories."

Answer—At the one factory in the province where they paid by test last year, some of the patrons kept at home the "fore" milk, and some, I understand, skimmed and sent the cream. Now, is this fair and just to all patrons? is a question that has come up at several of the annual cheese meetings. Again, under the present laws could persons so keeping back "fore" milk or skim milk be prosecuted for fraud? My answer to the first question is, No ; to the second, Yes. My reasons for the same are :

First Question. Suppose a patron has 200 pounds of three per cent. milk. That would be six pounds of fat. Now, suppose further that he skims the evening's milk, which we will say is 100 pounds of the same quality as his average. Say that he takes off twenty pounds of cream and mixes this with the 100 pounds of morning's milk and feeds the 80 pounds of skim-milk to calves and pigs. The 120 pounds of cream and morning's milk would test about five per cent. (making no allowance for loss of fat in skim-milk, which would be practically nothing if done with the separator), which would be six pounds of fat—the same as if he had sent the 200 pounds of whole milk testing three per cent., and he has the eighty pounds of skim-milk to feed. In other words, by paying according to test he would get just as much pay for his 120 pounds of cream and milk as he would for his 200 pounds of whole milk, and he has 80 pounds of skim-milk for feeding. Would this 120 pounds make as much cheese as the original 200? No, decidedly not ; because there is lost about 2.3 pounds of casein (reckoning skim-milk to contain 2 88 per cent. of casein, according to Fleischman) in the skim-milk, which casein or cheese-making material would have added to the quantity of cheese made. Of course we know this richer milk would make more cheese and richer cheese than the same amount of three per cent. milk, but would it bring that much higher price as to pay for skimming? We doubt it. This milk, however, will not be made up by itself, but will be mixed in a vat along with others, and some might say that the cream will add to the value of the whole vat of milk enough to warrant the extra pay. This cream would not, although normal rich milk would (if the average of the vat were rather low), because in normal milk there is an increase of the solids not fat with the fat, but in the case mentioned we have an increase in the fat without a corresponding increase in the other solids which are necessary in cheese-making.

In answer to the second question, so far as I am able to judge from the "Act to provide against frauds in the supplying of milk to cheese or butter manufactories," as amended by 55 Vict., Ontario Statutes, and published as an appendix in the Annual Report of the Dairymen's Association of Ontario, 1891, p. 201, this Act provides for nothing to cover the case in point, and should be amended so to do. "An Act respecting

the adulteration of Food, Drugs and Agricultural Fertilizers" Dominion Statutes) does, however, offer protection in this case. Section 15 of this Act says :—"If milk is sold, or offered or exposed for sale, *after any valuable constituent of the article has been extracted therefrom*, or if water has been added thereto," etc. Skim-milk and "fore" milk certainly contain a "valuable constituent" for cheese-making, and parties retaining such would be liable to the penalties provided in the Act.

Question 2.—This question was sent by the secretary of one of our joint stock factories : "The question has been raised at our cheese factory, and I find that a difference of opinion exists as to the right of the maker to deduct from a patron's milk when he is aware that the can or cans were exposed to a shower of rain, and when payment is to be made according to the fat as shown by the Babcock tester and the composite test principle in testing once a week. Would you kindly give me your opinion?"

Answer—The following opinion was sent on this question : It will not be necessary for cheese-makers to deduct for rain when paying by test (except to make a "good average"), as water added will not affect the total fat credited to a patron. For instance, say a patron has 100 pounds of whole milk testing 4 per cent. fat, that would be 4 pounds of fat. Suppose further that 10 pounds of rain-water gets into this milk. That will make him 110 pounds of milk and water, which will test about 3.65 per cent., and will still be credited with about 4 pounds of fat. Theoretically this water would affect the composite test, but practically it would not to any great extent. For an explanation of this see the College Report for 1892, Dairy department, under Composite Testing

Question 3.—"Do you think it will answer as well to take the avergage test for the month and multiply the month's milk thereby as to multiply each week's milk by the weekly test?"

Answer—It will be necessary to multiply each week's milk by the weekly test, as the following example will show :

1st week—300 lb. milk.	Composite test=3.00%	= 9.00 lb. fat.
2nd " —500 " "	" =3.50%	=17.50 " "
3rd " —400 " "	" =4.00%	=16.00 " "
4th " —600 " "	" =4.50%	=27.00 " "
Month—1800 lb. milk.	Average test, 3.75%=69.50 total fat.

$1800 \times 3.75 = 67.50$ lb. fat, which the patron would be credited with by multiplying the total pounds of milk delivered by the average percentage of fat for the month, whereas we see the actual pounds of fat delivered would be 69.50—a difference of two pounds.

If the pounds of milk delivered each week and the weekly test during the month are much the same, do not vary a great deal, then the difference in the two methods would not be so much. The more that the weekly pounds of milk and the weekly test vary, the greater will be the error in multiplying the month's milk by the average of the tests for the month.

Shall I Buy a Cream Separator?

This question has been asked by a number of dairymen who are engaged in the manufacture of butter on the farm. In giving an answer, we should take into consideration the following points :

(1) The increased quantity of butter we may expect to receive by the use of a separator.

If the cows are fresh, and the deep can or the shallow pan are used in the very best manner, our experiments would lead us to conclude that there will not be very much difference in the quantity of cream and butter obtained from the three methods. But if the cows are strippers, or have been milking for six months or more, there will be a decided advantage in favor of the separator, which, if properly managed, skims this kind of milk just about as closely as any other. This was illustrated last winter when a prominent dairyman from Waterloo county brought down some samples of skim-milk to the College dairy to be tested. One sample tested five-tenths of one per cent. of fat, and the other showed one and one-tenth per cent. of fat. When it was explained to him that

in the first case he was losing over half a pound of butter in every one hundred pounds of skim-milk, and over one pound in the second case, he said he could not stand that, and went to the city to negotiate for a separator. As to the reason why one sample showed more than double the amount of fat than the other did, we found that the first had been skimmed at a temperature of 40°, and the other at about 50°. This coincides with all our work here, which emphasizes the need of cooling below 45° to get good results with the deep pail system of creaming.

Judging from samples of skim-milk tested in different parts of the province, it would be safe to conclude that, as ordinarily handled on the farm, the separator will give from 20 to 25 per cent. more butter than the setting methods.

(2) Effect on the quality of the cream, butter and skim-milk.

As compared with the deep pail there would not be much difference, but there is an improvement in the use of the separator over the shallow pan. The chief drawbacks to the shallow-pan method are exposure to taints, the cream being too thick, and the skim-milk likely to be sour. I believe that as good butter can be made by the deep pail system as by the separator; but, under average conditions, the chances are in favor of the separator, as it removes all dirt, delivers the cream fresh, and gives the butter-maker a better opportunity to control the cream. The advantages are decidedly in favor of the separator when we consider the effect on the skim-milk. The best time to separate is immediately after milking, while the skim-milk still retains the heat from the cow, and is in the very best condition for feeding to young calves. Some fatty food added to this will raise excellent stock for the dairy.

(3) Cost of the machine.

This is really the drawback to the use of this method. A machine to separate the milk from fifteen or twenty cows in one hour is catalogued at from $150 to $225. Usually, however, those who sell these goods make a liberal discount from catalogue prices for cash. In buying one, I would recommend getting a larger machine than the present requirements of the herd, as you will probably be increasing, rather than decreasing the number of cows kept. For an ordinary sized dairy, I would not recommend buying a machine of less capacity than 500 pounds (50 gallons) per hour. The difference in price between a 250 pound machine and a 500 pound machine is not much, while the saving of time in using the larger machine is considerable.

(4) Cost of running, and expense for repairs.

Power of some kind will be needed. The advocates of hand-power separators may consider that turning the crank of a machine for an hour or two night and morning is easy work, but it is anything but fun. As soon as the novelty wears off, the preference for it will also disappear. The power used must be steady and regular. The tread power appears to be a cheap one, and gives satisfaction.

Oil is the chief item for running expenses, and this should be of good quality and used plentifully. The cost for repairs should be slight. Nearly all the machines now on the market are made durable, and the wearing parts are easily replaced at a small expense. Do not buy a machine which has not these qualities.

(5) Labor involved.

With a small quantity of milk the labor of getting the machine ready, and washing up afterwards, would be greater than with the setting methods; but where 200 pounds of milk or over are handled each day, there would be less labor with the separator. In winter time separating once a day is all that is necessary. This saves a great deal of work, as one washing a day of the machine and its parts is all that is required.

While not wishing to "boom" the separator, it is my opinion that for ten or more *good* cows it will pay a man who knows how to make good butter, and gets a good price for the article when made, to invest in a suitable machine. Every winter creamery should have one, and it would pay most of our summer creameries on the cream-gathering plan to put in a machine to separate the cream for those patrons living near the factory.

What is a Creamery Inch?

As a number of patrons of creameries on the cream-gathering plan might wish to know how the proceeds are divided, it may not be out of place to explain what is meant by a "creamery inch," and also what is meant when the creamery-man says cream tests 100, 120 or 150 per cent.

A creamery inch is one inch in depth of a pail twelve inches in diameter, or about 113 cubic inches. This amount of cream is supposed to make one pound of butter. Two inches in depth of a pail 8½ inches in diameter will give about the same bulk. When creameries first began measuring the cream, each patron was paid according to the *inches* of cream sent; but cream varies a great deal in quality, owing to a difference in the amount of skim-milk present, so it was found necessary not only to measure the cream, but also to test it. This is done by means of what is known as an oil-test churn. This churn differs from the Babcock test in that the oil test gives the *churnable* fat in cream, while the Babcock gives the absolute fat present.

When cream tests 100 per cent., it means that one creamery inch of such cream will make one pound of butter; a 120 per cent. test means 1.2 lb. of butter for each inch; a 150 per cent. test means 1½ lb. of butter for each inch, and so on. The driver measures the inches of cream given by each patron, and takes a test sample. The butter-maker makes the test, and by referring to a chart furnished with most test churns he is quickly able to tell how much butter each patron should be credited with. For instance, ten inches of 100 per cent. cream credits the patron with ten pounds of butter. Ten inches of 120 per cent. cream credits him with twelve pounds of butter.

The test ought not to vary much from day to day, and when it does vary it is likely due to one of the following causes:

Different persons skimming, who leave more or less than usual of skim-milk with the cream.

Careless sampling by the drivers. The cream should be well mixed before the sample is taken, and samples taken from every can or crock of cream.

Inaccurate testing, or measuring of the oil. This work should be carefully done, and done according to directions sent with each churn.

VISITORS.

The number of visitors who call on us is increasing. Thousands of our own farmers have been to see us during the past year, and it is gratifying to meet such on my travels and hear them say they are putting into practice some idea which they got while on a visit to the Experimental Dairy of the College. Besides these, a number of foreign visitors have called to see what we are doing in dairying, and generally they express surprise to see the buildings and equipment for teaching this branch of agriculture. These men go back to their own country with new thoughts and new experiences, which they will doubtless add to their past practices, making them more perfect. They carry away some of our best methods, and we shall see the results in an improved product from the countries which these men represent, and it is advisable that we should also follow their example and try to get some of their best ideas and methods of dairy practice. All give and no take will advantage them and disadvantage us. I hope to be allowed an opportunity to visit some of the best dairy centres of Europe during the summer of 1894.

IMPORTANCE OF GOOD, PURE MILK FOR CHEESE FACTORIES AND CREAMERIES.

New competitors from Australia, New Zealand and Africa, to which latter place a travelling dairy has recently been sent from Great Britain, will make it all the more difficult to sell Canadian dairy goods at a profit. Australian grass-fed butter comes into direct competition with Canadian fodder butter, and as a result large quantities of creamery make were returned in 1893 from British ports and sold in Halifax and Montreal. A large exporter told me that about 4,000 packages of Canadian butter had been returned during the season. This butter, he said, if sold in the foreign market

would not have netted more than 16 or 17 cents per pound, while it brought from 19 to 21 cents in the Canadian market. What does this teach? Two things, at least. First, that we have been seeking a market a long way off, while we have a better one at home, and will continue to have, for fresh creamery, for some years yet to come. Canadian people want good butter, and are willing and able to pay for it. Butter has brought from 25 to 30 cents per pound most of the winter in our larger towns and cities. Second lesson: All export butter should be of the finest quality; none other should be sent across the water.

At the present time where do we need to direct the improvement forces, that fine cheese and fine butter may be made in Ontario, both for the home and export trade? I say, without hesitation, towards the place where the milk is produced, and at the persons who are responsible for the milk sent to be manufactured. Our cheese and butter-makers, as a class, are well up in their professions. As a rule they are live, energetic men and women, and were every other class who have to do with the dairy industry as well posted and practised, there would be a marked improvement before long. Do not understand me to consider them perfect (for who is so?), but the means now in use, and which are being brought into use, are quite sufficient to educate this class. Why not educate the producer, and have the procession all move together?

What then Needs to be Done?

1. The dairymen of this country need to be impressed with the fact that a cow which produces less than 6,000 pounds of milk or 250 pounds of butter in a year is not worth wasting food and labor on her carcass.

2. Every feeder of cattle should know what foods are cheapest and best for milk production. For summer feeding nothing will equal good grass, with as great a variety as possible. Too many pasture fields lack a variety, and consequently we do not get those fine flavors produced on natural pastures. In addition to this the following might be fed: Bran, cotton-seed meal (not over two pounds a day to a cow), green peas and oats, tares and oats, and clovers, and in early autumn green corn. Winter feed should be cheap and succulent During the past winter we have fed ground wheat with good results. Bran, the oil meals, peas and oats, corn, clover hay, corn ensilage, mangels, sugar beets and carrots may be profitably fed.

3. It will pay every owner of a factory to send some one around to the patrons at the *beginning*, the middle and the end of the season, and instruct them how to care for milk. We had to do this in connection with our Dairy School, and it would possibly have made us several dollars, have added to our reputation, and saved a great deal of worry and trouble, if we had done this sooner. A marked improvement in the quality of the milk, cream, butter and cheese was noticed after this was done. There are plenty of people who have a very faint idea of how to care for milk properly, and are willing to learn from those who do know. There are some, however, who will not be taught anything in reference to this, and they and their milk should be let alone. Let every owner of a factory send some one to instruct the patrons how to care for milk. (Greater care should be exercised in the selection of this person than in selecting a cow.) Failing this, have a copy of "Hints on the care of milk for cheese factories," which has been published by the Department of Agriculture, Toronto, along with other matter prepared by the dairy students of the O. A. C., sent to each patron of the factory at least twice during the season. It will not cost more than two or three dollars to get these printed, and it may be worth several dollars before the season is over. In the meantime it would be well to emphasize the need of:

1. Food for the cows that has no bad flavor.
2. Water that is pure enough for human beings to drink.
3. Strain and aerate the milk as soon as drawn from the cows. A simple pouring or dipping of the milk will effectually aerate it if continued long enough. If a patent aerator is used, be sure that it is kept absolutely clean. Look around the cracks and odd crevices to see that nothing lurks there. Morning's milk needs aerating as well as the evening's.

4. Keep the milk where there are no bad odors.

5. Leave the milk at the temperature of the atmosphere, except in very hot weather; then it may be cooled slightly.

6. Empty and wash the can as soon as it returns home. Drivers should put a pail of cold water in each can before leaving the factory. This is better than whey.

7. Rinse pails, cans and all milk utensils, first with cold or lukewarm water; second, wash with hot water, and finally scald, allowing the utensils to *dry themselves* in a pure atmosphere. *Never wipe a can or pail.* It gives a dish-cloth flavor.

Elaboration of Milk.

All organized bodies are an aggregation of cells. A cell is the smallest particle into which a plant or animal may be divided. "Cells possess the properties of nutrition, reproduction, growth, development, and, in many cases, their contents are capable of motion and manifesting irritability." The udder of the cow is a gland made up of numerous vesicles (cavities) which consist of a membrane lined with epithelial cells. These cells are the secreting organs or the seat of the changes by which milk is produced. A number of these vesicles gathered together form what is known as a lobule, and lobules united form a lobe which is surrounded by connective tissue, having a common outlet into the milk cistern situated at the upper portion of the teat.

Besides cells, the mammary glands consist of fat, blood, nerves and muscles. There are two glands which lie alongside each other, separated by a fibrous partition. It will be noticed that the cow's udder is divided lengthwise, not across the udder. Each gland has two outlets (on the side), and sometimes three. The whole is covered by the outer skin of the animal.

Exactly how milk is secreted or elaborated we do not know. There are two theories put forth in explanation of the process. The first one, known as the "Transudation Theory," assumes a simple filtering of the constituents of the milk from the blood through the gland, and a turning of them into milk by this process. The objections to this theory are put thus by Armsby: "The milk is not simply secreted from the blood like the urine in the kidneys, or the digestive juices in the stomach and intestines, but is formed in the milk glands from the cells of the gland itself—it is the liquified organ. This is shown even by the composition of its ash, which, like that of all tissues, contains much potash, and phosphate of lime, while the fluids of the animal body are poor in these substances and rich in chloride of sodium (common salt); the ash of milk contains three to five times as much potash as soda, while the ash of blood, on the other hand, contains three to five times as much soda as potash. Was the milk simply a transudate from the blood, it would have a similar composition, and could not serve as the exclusive food of the young animal, since it would not contain all the elements necessary for growth; but since it is a liquified organ, it is exactly adapted to build up other organs."

The second theory, known as the "Metamorphic" (change of form or shape), assumes that the milk is formed in the gland by the decomposition of the cells of that organ. Professor Sheldon says that a combinatian of the two will probably give the most satisfactory explanation, and this is more apparent when we consider the sources of the various constituents of milk. Neither casein or milk-sugar are found in the blood, consequently they could not be filtered from it, but are probably the result of a special cell activity. Fat, though found in the blood, is not there in sufficient quantity to supply the fat of the milk. "The milk-sugar, casein, and fats are all formed by the direct activity of the epithelial cells as a result of the decomposition of their protoplasmic (first formed) contents or their action on the food constituents in the blood. The other constituents of the milk, the water and salts, evidently result from a direct process of transudation from the blood, with the exception that, without doubt, a certain percentage of the potassium salts, and phosphates, like the specific milk constituents, originate in the metamorphosis (change) of the protoplasm (first matter) of the secretory cells."

From the preceding we would judge that the character of the gland has considerable influence on the quantity and quality of milk produced by a cow. Other things, such as food, surroundings, method of handling, period of lactation, frequency and regularity of milking, are all supposed to contribute somewhat towards the quantity and quality of milk.

Quick Churning.

A great many people are anxious to have the churning done in a few minutes. From ten to fifteen minutes exhausts the patience of the average man or woman. I saw an exception to this while out with the travelling dairy in the eastern part of the province in the month of June. As we drove along over the hills and through almost impassable roads, it being the time to do "road work," we passed a log house, and on the shady side was a man and two women. The man was exercising the muscles of his arms in a perpendicular manner, his hands tightly clutching the top end of a dash churn. From appearance I should judge that when the man grew tired churning, first one woman and then the other took a turn at it. They had evidently made up their minds to a half-day job, and did not seem to be at all put out at it. As a rule, however, the churner wants it to "come quick," and have done with it. Some apparently good authorities recommend quick churning, but our experience goes against this, especially in hot weather. The trouble we have had with rapid churning in summer is that the butter is usually soft, and the churning is not so effectually done as when a longer time is taken. In summer we take from forty to fifty minutes to churn, and as a result the butter nearly always comes out of the churn nice and firm and in granular form. This, we think, pays us for the extra time taken, and if we wish it may be salted, worked and printed ready for market at once, which cannot be done if the butter comes out of the churn soft. Another cause of soft butter is allowing the cream to become too warm while it is being collected for churning. It should never be above 65° in hot weather. The time required to churn depends upon:

1. *The Temperature of the Cream.* The warmer the cream to about 70° the more quickly will it churn and the softer will be the butter. The lower the temperature at which the butter will come in from forty to sixty minutes (or less time) the firmer will the butter be. The right temperature for churning each churner must find out for himself. From 56° to 60° in summer will be a fair range for most cream; in summer we churn at about 58.

2. *The Temperature of the Churn and Room.* These have quite a marked influence on the time required to churn. The warmer the room (other things being equal) the more quickly will the cream churn. The same may be said of the temperature of the churn. If it is wished to churn at 58° the churn should be about that temperature when the cream is put in. In nearly every case the temperature rises after churning for some time, due to friction.

3. *The Relation Between the Size of the Churn and the Amount of Cream to be Churned.* The larger the churn, or the smaller amount of cream to be churned, the more quickly will the churning be finished. A box or barrel churn, without dashers of any kind, ought not to be much over one-third full.

4. *The Ripeness of the Cream.* In reference to this latter point we have found that by raising the temperature a few degrees sweet cream may be churned in about the same time as ripe or sour cream. The loss of butter, however, will be considerable, as sweet cream to be effectually churned requires a temperature of from 50° to 55°, and one to one and a-half hours to churn.

5. *The Character of the Cream.* Cream from strippers' milk usually takes a longer time to churn than that from fresh cows.

The lesson to be learned is, that it will pay to take a little more time at the churning and have it completely churned, and the butter firm and granular when lifted from the churn. Quick churning and soft butter nearly always go together.

The Making of Cheese in Spring, Summer and Fall.

This Bulletin (No. LXXXVIII) was prepared by Committees of the Special Dairy School, 1893, at the Ontario Agricultural College, as follows:

Spring Cheese: A. T. Bell, Tavistock, Ont., (Chief Instructor in Cheese-making); W. W. Grant, Lakefield, Ont.; L. A. Zufelt, Morrisburg, Ont.

Summer Cheese: A. T. Bell, Tavistock, Ont., (Chief Instructor in Cheese-making); L. Patton, Oxford Mills, Ont.; J. S. Clark, Warwick, Ont.

Fall Cheese: T. B. Millar, Burgoyne, Ont., (Asst. Instructor in Cheese-making); W. Bothwell, Woodstock, Ont.; C. Stewart, Flesherton, Ont.

Care of Milk for Cheese Factories.

In order to maintain the proud distinction that Canadian cheese has already won in the British markets it is absolutely necessary that the dairymen shall put forth greater efforts than they have in the past to produce a better quality of milk. Progress must be the watchword.

The maximum of profit can be obtained only by the clear-thinking, intelligent dairyman, who breeds and feeds to produce the greatest amount of milk of a good quality at the least possible cost.

The faithful and constant observance of the following points will result in a marked improvement in the condition of the milk supplied to the cheese factories, an improvement which is much needed, and the bringing about of which will enable the cheese-maker to produce an article much superior to anything that has been made in the past, and by so doing we can maintain our supremacy in the English market, realize a better price for our goods, and add very materially to the profits of the dairyman.

Nothing but pure milk from healthy cows should be sent to the factory. To secure this, cows should have abundance of wholesome, nutritious food and pure water, with access to salt at all times.

The greatest possible care should be taken to prevent cows drinking stagnant water. Milk from such cows is invariably tainted, and no amount of skill on the part of the cheese-maker can produce from it a really fine cheese.

Immediately after the milk is drawn it should be strained, then aerated by dipping or pouring, which can be done very effectively while the milk is yet in the pails. Be sure that this work is done in a pure atmosphere, with clean surroundings, away from the stables or anything else of an impure nature, for unless this be attended to properly aeration will be a detriment instead of a benefit.

It is not necessary to cool milk at night, unless the weather be extremely hot, in order to have it in the best condition for delivery at the factory in the morning (provided all pails, utensils, strainers, etc., have been thoroughly washed, then scalded with boiling hot water and well aired before using).

It is just as important that the morning's milk should be well aired before sending it to the factory; not only in the summer should milk be aerated, but also in the spring and autumn.

The milk stands should be built in such a way as to exclude the sun and rain, and yet allow a free circulation of air around the cans.

The organisms that produce bitter or tainted milk, or any abnormal change, are to be found only where there is filth and carelessness in handling, so that in all cases when complaint is made of impure milk the remedy must be *extra cleanliness*.

Spring Cheese.

The cheese-maker who is desirous that his cheese shall be of the finest quality will accept nothing but good, pure milk. All tainted or sour milk and the first milkings (colostrum) should be refused.

Heat the milk to 84° Fahr. The rennet test should then be used to ascertain the degree of ripeness. To make this test take 8 oz. of milk from the vat, add to it one drachm of rennet extract, stir rapidly for ten seconds. If coagulation takes place

in from 17 to 20 seconds the milk is sufficiently matured for the addition of rennet. A slight variation from this may be necessary to suit different localities, but a few trials will enable the maker to tell when the milk is properly ripened. A very simple way to tell the exact moment when coagulation takes place is to drop a bit of burnt match into the milk. It assumes a rotary motion when the milk is stirred. Then count the number of seconds from the addition of the rennet until the stick ceases to move. This gives you the exact time required for the milk to coagulate.

Great care and watchfulness should be exercised at this season, as milk sours very rapidly during the early period of lactation.

Use sufficient rennet (from 3 oz. to 4 oz. per 1,000 lb.) to coagulate the milk fit for cutting in from 15 to 20 minutes. In cutting use the horizontal knife first, then the perpendicular. Begin when the curd is somewhat tender and cut slowly, with a firm, steady motion and continuously, until the cutting is completed.

Let the curd settle a few minutes to allow the surfaces to heal slightly, then stir with the hands—very gently and slowly at first—for about ten minutes. Rough handling at this time sets free a great number of small particles of curd which go off in the whey and very materially lessen the yield. Then the agitators may be put in and the steam gradually turned on. Take about 30 or 35 minutes in heating up to 98°. Continue stirring about five minutes after the steam has been turned off, when the curd may be allowed to settle. Draw off a portion of the whey at this time that you may not be caught by a rapid development of acid. Then stir the curd occasionally (a common hay rake is best suited for the purpose) to prevent matting and to secure a thorough cooking of each particle of curd.

When the curd is thoroughly cooked and shows $\frac{1}{8}$ in. or less acid on the hot iron the whey should be removed. After dipping the curd should be well stirred with the hands to effectually drain off the whey before allowing it to mat. When it has become sufficiently matted cut into convenient strips (about 8 in. wide) and turn. In about 15 minutes they may be turned again and piled two deep. Turn frequently (four or five times an hour) to prevent any whey from collecting on or about the curd, and to ensure uniform ripening. The temperature should be maintained at about 94° while the breaking down process is going on, and when the curd presents a flakey appearance on being pulled apart and shows acid to about $\frac{3}{4}$ in. on the hot iron it may be milled and then aired by stirring occasionally. When it becomes soft and velvety, smells like newly-made butter, and shows some fat on being pressed in the hand, it may be salted at the rate of from $1\frac{1}{2}$ lb. to 2 lb. of salt per 1,000 lb. of milk.

The temperature when salting should not be higher than 86°. Put to press in about 15 or 20 minutes, or when the salt is thoroughly dissolved. Have the temperature at this time between 80° and 85°. Apply pressure gently at first, until the whey begins to run clear, then gradually increase. After the cheese have been in the press about 45 minutes they may be taken out and neatly bandaged; only pure water should be used in bandaging. They should be turned again in the hoops in the morning. See that no rims or shoulders are left on the cheese, but have them neat and stylish in appearance, and of uniform size. They should be pressed for at least twenty hours before removing to curing room.

The curing room should be kept at an even temperature of about 65° or 70°, and should be well ventilated.

Summer Cheese.

The same treatment is required in handling and caring for the milk. Aeration and cleanliness should have the same careful attention.

When the milk arrives at the factory each can should be subjected to a strict examination by the cheese-maker (do not leave this to the poorest helper), to detect, if possible, and reject all bad flavored or tainted milk. There is no excuse for having milk of this kind. What one patron can do all can do—care for it properly and have it arrive at the factory in the very best possible condition.

When the milk has been received heat it up gradually to 86°. When this has been done try it with the rennet test to ascertain the degree of ripeness. It is advisable to do this even in handling very ripe milk, for it enables the cheese-maker to know just about

how fast the curd is going to work. If possible have the milk in that condition that all the whey will be drawn in from 2½ to 3 hours from the time the rennet is added, with ¼ in. acid on the curd by the hot iron test. Use enough rennet to coagulate the milk sufficiently for cutting in 30 minutes.

Start to cut a little early. Take plenty of time, and do not hash or slash the curd. Use the horizontal knife first, finishing with the perpendicular, and if the milk is overripe and going to work fast—as is quite often the case in hot weather—then cut the curd considerably finer. By so doing the cooking process is hastened; the cubes of curd being small they are much more easily cooked than if left the ordinary size. When the cutting is finished start to stir very gently at first, or until the curd becomes somewhat firm. Do not apply heat for 10 or 15 minutes after stirring is commenced. Heat gradually up to 96°, taking fully one-half hour to do so, unless in the case of fast working curd, which requires to be heated up as quickly as possible to ensure a thorough cooking. Continue stirring for some time after the desired temperature has been reached to prevent matting and to ensure a more uniform and thorough cooking of the curd.

Draw off part of the whey soon after the heating has been finished, and if there are any bad odors or taints draw the whey down quite close to the curd; then by keeping it stirred and airing well the flavor will be very much improved. Draw off all the whey when the curd shows ¼ in. acid by the hot iron test, and continue hand stirring until it is sufficiently dry before allowing it to mat, and when matted break or cut into convenient strips and turn it over at short intervals (about every 15 minutes) piling a little deeper each time it is turned, and never allow any whey to gather on or around it.

Grind early, or when the curd strings 1 to 1¼ in. on the hot iron. Keep it apart and well stirred and aired after grinding until ready for salting.

In the case of gassy curd, try to retain more moisture in it when the whey is drawn off by stirring less. Grind in about the usual time, and when it is partly ripe pile deep, and if the whey begins to lodge around it open the pile, allow the whey to drain off, then pile again. Continue in this way until the curd becomes velvety and buttery, when it is ready for salting. Hoop in from 15 to 20 minutes after the salt has been well stirred in.

Apply pressure very gently at first, or until the whey begins to run clear, after which it may be safely increased. In from 45 to 60 minutes the pressure may be removed, the hoops taken off, the cheese dressed neatly, and put back to press again. Apply full pressure before leaving there for the night.

Turn them in the hoops in the morning, paring off any corners or shoulders which may arise from imperfect fitting followers, putting back to press for five or six hours longer, when the cheese will be ready to take into the curing-room, which should be kept as cool as possible during summer.

We would strongly advise cheese makers to keep a record of each vat, the condition of the milk, and how it works each day. Stencil the cheese with the date when made, the number of the vat made from, and by so doing a great many difficulties may be overcome.

Fall Cheese.

After getting the milk into the vats heat up slowly to 86° or 88°. Ripen the milk well (a few seconds less than for summeer cheese) before setting, and if the weather be cold better results can be obtained by using a little clean-flavored sour milk for a starter, but do not under any circumstances use thick milk.

Enough rennet should be used to cause perfect coagulation in forty minutes.

Begin cutting with the horizontal knife and finish with the perpendicular, cutting continuously until it is finished.

After the cutting is completed the curd should be stirred slowly and gently for ten or fifteen minutes before any heat is applied, then raise the temperature gradually to 96° or 98°, taking about forty-five minutes to attain the desired temperature. Dip the curd when it shows ¼ in. acid by the hot iron test, stir well until the whey has all escaped, then keep the curd warm (about 94°) and allow it to mat. When matted cut or break into convenient strips and turn over occasionally. Do not allow any whey to gather in

pools on or around the curd. When it feels mellow or will show $1\frac{1}{4}$ in. to $1\frac{1}{2}$ in. acid by the hot iron test it should be put through the curd mill. Stir and air well immediately after grinding. When the curd is well matured and has a silky, buttery appearance, the salt may be applied. Use at the rate of $2\frac{3}{4}$ lb. to $3\frac{1}{4}$ lb. of salt per 1,000 lb. of milk, varying the quantity to the amount of moisture in the curd. The temperature at this stage should be about 86°. The curd may be hooped and put to press in from fifteen to twenty minutes after the salting is done. Apply pressure very slowly at first, and allow the cheese to remain in the press one hour before turning. Only pure warm water should be used when bandaging.

Turn the cheese in the hoops every morning, never allowing a cheese to be placed in the curing room unless it has a perfect finish.

The temperature of the curing room should be kept constantly between 60° and 65°.

When coloring pour the coloring into a dipper of warm milk from the vat, then draw the dipper quickly along under the surface of the milk from one end of the vat to the other, then stir well and there will be no danger of streaks in the curd. Have a dipper with a long handle for the purpose.

Rennet should be diluted to one gallon of pure water for each vat, and the milk should be well stirred for at least five minutes after the rennet has been added. In case the milk is very ripe two minutes will be ample time to stir after adding the rennet.

Everything in and about the factory should be kept scrupulously clean. The cheese-maker who fails to do this need not grumble if his patrons follow his example.

All strainers, sink-cloths, etc., should be well washed, then scalded and thoroughly aired each time they have been used.

The vats, pails, curd-sinks, etc., should be scalded with boiling hot water after washing, and if the water can run out readily they will dry off in a few minutes without wiping. Do not use a dish-cloth, as it usually leaves an unpleasant flavor.

This Bulletin has been copied very largely by the agricultural and dairy press of both the United States and Canada. We have received a very great many inquiries for it, and makers throughout the Province have said it is one of the best publications on the subject of cheese making. When we consider that it is the experience of over 30 cheese makers (some the very best) from both Eastern and Western Ontario, they being represented by the committees, the Bulletin becomes more valuable than if it were the production of one person.

Our Experience With Extractor Butter.

As the Butter Extractor is somewhat new to Canadian dairymen, in fact so far as I know the machine used in the Dairy School this year is the only one in use in the province, it might interest them to know how this machine and its product succeeded with us.

The difference between an extractor and a separator is, that the latter takes the cream from new milk, while the former goes a step further and churns the cream—after separating—into butter all at one operation. The process is quite simple, and when the working of the machine is understood there need be no difficulty. The machine used was a small sized one (No. 4), capacity as an extractor about 300 lb. per hour and as a separator 350 lb. to 400 lb. per hour, made by the Farm Machine Co., Bellows Falls, Vermont. As a separator it works very nicely and also does good work, as an extractor it skims down to a "trace" of fat in the skim or buttermilk as it should be called.

The milk requires to be put through the extractor at a lower temperature (70 to 72 degs.) for extracting than for separating. When the butter comes from the machine it is in small particles about the size of pins' heads and has more or less milk mixed with it. It requires to be washed similarly to ordinary butter and takes more salt to give it the same saltness. After being washed, worked and salted, it tastes something like sweet cream with a little salt in it. Those who like a very mild flavored creamy butter will find in the extractor butter that which suits their taste. It has, however, a somewhat greasy appearance and taste, lacking the grain found in good butter as we understand it. It also lacks the "bouquet" smell which buyers look for in butter of good quality. For two or three days after being made it is quite eatable, but with us it began to go off in flavor after this time, until at the end of a month it was wholly unfit for use.

On going into the refrigerator April 17th, Mr. Rogers, our butter-maker, said to me, "We shall have to get the extractor butter out of this as it will spoil the flavor of all the rest," (most of this butter had been made during March). I said, "Well, what shall we do with it."

"Give it to the pigs," said he.

"No," I said, "I'll tell you what we will do. You are going to churn to-morrow, are you not?"

"Yes."

"Well, save the buttermilk from the churning; take this butter and melt it, then churn it in the fresh buttermilk."

Accordingly on the morrow Mr. Rogers put about 25 pounds of this butter in a deep pail and then set the pail into a can of hot water (about 175 degs.) and melted the whole lot. The churn had the buttermilk in it. Steam was up and he quickly put the melted butter into the buttermilk, started the churn and in about ten minutes had as nice granular butter as one would wish to see. The buttermilk was now drawn off and the butter washed with cold water. This was removed and it was again washed with brine water and allowed to drain in the churn. After some time it was put on the worker, salted and worked. Owing to the water being a little too cold the granules were somewhat difficult to press together and they presented a pretty sight as they moved about under the rollers like grains of gold. The writer turned the crank and Mr. R. did the ladling and turning. By-and-by it began to mass and the buttermilk appeared. This was a great surprise as when in the granular form we would have declared there was not a particle of milk in the butter. As it was pressed more, the buttermilk increased until quite a large quantity of milk was taken from what appeared to be a mass containing no milk whatever. In explanation of this we concluded that the extractors must drive into the particles of butter more or less milk, else it does not separate the curdy portion from the fat or butter. This doubtless accounts for the fact that the butter did not keep, as butter will not remain good which contains a high percentage of curdy matter. This causes a great deal of farm butter to spoil quickly. It can be remedied by washing the butter in the granular form.

When this butter, which was wholly unfit for use before treatment, had been put up in neat pound packages and wrapped in parchment butter paper, it would have tempted almost anyone to purchase it. Of course the flavor was not first-class, but it will do very well for cooking, and a great many times during the past winter I have eaten worse butter at hotels and on the tables of persons who pride themselves on knowing how to make good butter. This, then, seems a simple way to improve butter that is off in flavor.

What then are the conclusions to be drawn from our experience with extractor butter?

1. We would not recommend butter-makers to invest much money to manufacture this line of butter as the market for such is very limited at present.

2. It should be shipped to the consumer immediately it is made as we do not find it improve with age.

3. This butter lacks the flavor and aroma which customers generally look for in a first-class article.

4. That the Extractor is not likely to become an important factor in Canadian dairying for some time yet. The use of the cream separator, proper ripening of the cream and the making of fine butter in the old box or barrel churn are three things which butter-makers need to study at present. To our ordinary makers, I would say:

"Be not the first by whom the new is tried
Nor yet the last to lay the old aside."

Dairy Frauds.

Last year I referred to a fraud known as the "Black Pepsin" swindle which was "worked" among our dairymen. This year we have encountered two similar ones. The one we have tried and the other we expect to as soon as arrangements can be made.

Early in the year a man visited us who had a "Butter Increaser" that would work wonders in butter-making. (In justice to the man who brought the "increaser" to us for trial, I would say that he was honest in his intentions and, like many more, wished to know if it would do what was claimed for it, and if so he intended to handle the article in Ontario)

A circular entitled "Are you interested in Butter-making? if so, this circular contains some facts and information which should receive more than a passing notice," sets forth some rather new doctrines in dairying. It commences by stating that "It is commonly supposed that butter-fat exists in cream only in the proportion of two pounds of fat to each gallon of cream, which opinion is, no doubt, based on the fact that this is the highest average yield of butter." This alone is enough to convince anyone who knows a little about dairying that the person who wrote the foregoing is not an expert dairyman.

After "considering the character of milk," giving its chemical composition, the circular goes on to speak of "The Formation of Cream" and its average composition. (A table is given showing percentage composition.) After referring to this table it says, "From it you will learn that each gallon of cream contains, on an average, two and two-thirds pounds of butter, and as the highest average yield is known to be but two pounds, it is thus proven that *from every gallon of cream churned there is two-thirds of a pound of butter left in the buttermilk.*" If every dairy statement rested upon such proof as the foregoing where would we be? It further states that the "Increaser" "takes every particle of butter out of the cream, thereby saving the 20 to 30 per cent. now lost in the buttermilk. We wish it distinctly understood that Chase's Butter Increaser is entirely free from, and foreign to, such articles as the so-called Black Pepsin, etc." It is unnecessary to quote any more. Experiments were made with following results:

	lbs. Cream.	Time reg'd to churn.	lb. butter.	Per cent. of fat in buttermilk.
May 3rd.	31.5 (increaser added)	20 mins.	7.53	0.15
	31.5 (same lot of cream no increaser)	20 "	7.59	0.15
" 4th.	22 (increaser)	14 "	6 91	0.05
	22 (no increaser)	17 "	7.19	0.05

Comment is unnecessary.

I may add that the agent, or would-be agent, went to Chicago after leaving us, to interview the firm and wrote back saying that he was sure if I could only see Mr. —— I would be convinced that it was a good thing. A hearty invitation was extended to the gentleman to visit us and we would do all in our power to make the experiment a success, but so far he has not called. We have still a sample of the liquid, and still invite him to show us how to increase our butter production. We are after light as well as others.

The latest in this line is "Thurston's New Butter Process," which "will make two to three times the amount of butter that can be made by any other method yet invented; no chemicals or extra machinery required." The gain is figured out as follows: "Milk weighs ten pounds per gallon; one cow giving two gallons of milk per day, in one year will average about 550 gallons weighing 5,500 pounds, and by the old method produces 220 pounds of butter. By the new process of 8 pounds per 100 pounds of milk, 440 pounds of butter are produced in one year. A gain by the use of new process over and above the old method of 220 pounds at fifteen cents per pound brings $33 per year or an average monthly increase of $2.75 over the old method."

In regard to this I would say that it is impossible to make this increase, if the butter is all taken out by ordinary churning, which can be done. It might be possible to make an increase by incorporating some of the solids not fat of the milk or a large percentage of water and thereby produce a mixture that would not be good butter in the ordinary and proper acceptation of the term.

There are no experiments to report of the "new process" at this date, though the firm has signified its intention to call on us shortly. Before pronouncing definitely about this I would like to have an opportunity to try the "process," but would say here by way of warning that my judgment is that they cannot do honestly what they claim. To the

farming public and dairymen specially, I would say: *Do not invest your money in anything of this nature unless the parties are able to produce satisfactory evidence that what is being sold has been tried and proved successful by either the Dominion Experiment Farm or our own farm at Guelph, who have a better opportunity to test these things than the ordinary dairyman.* So far as possible we shall be pleased at any time to give dairy utensils, butter processes, cheese methods, or goods used in the dairy and which are likely to be of service to farmers, the fairest and fullest trial.

This much had not been written were it not a fact that a number of farmers and others have been "taken in" by fraudulent methods and even now there is a case before the courts in which a man, who has apparently lost a large sum, is suing the parties for obtaining money under false pretences.

Still another came to my notice this week. It is called "Gastric Sodea," and makes similar claims to those previously mentioned. A leading druggist in Guelph had never heard of such a substance, but has promised to get some for us if it can be obtained.

In conclusion, I wish to express my appreciation of the good work done and the faithful assistance rendered our butter-maker and dairyman. The cattleman has kept the stables in a model condition, and looked after the stock well To the instructors of the Dairy School I am indebted for their good service during the short course. Great credit is due the persons entrusted with the travelling dairies.

To yourself I am under obligation for counsel and advice at various times during the year, and for the deep interest taken by you in the welfare of the Dairy Department.

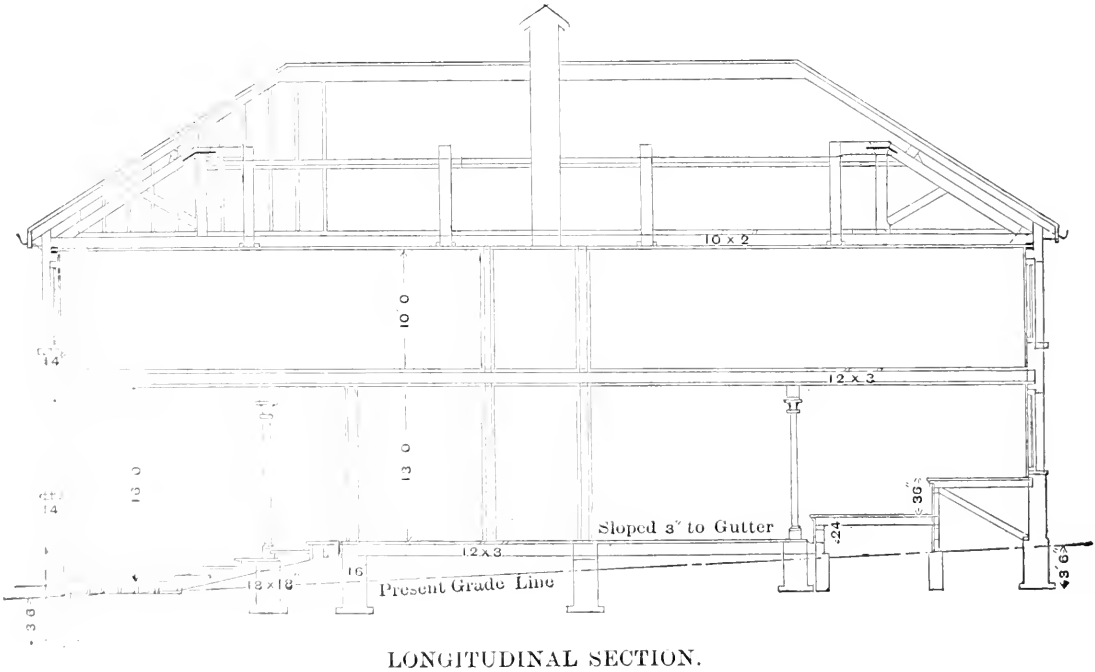
All of which is respectfully submitted.

Your obedient servant,

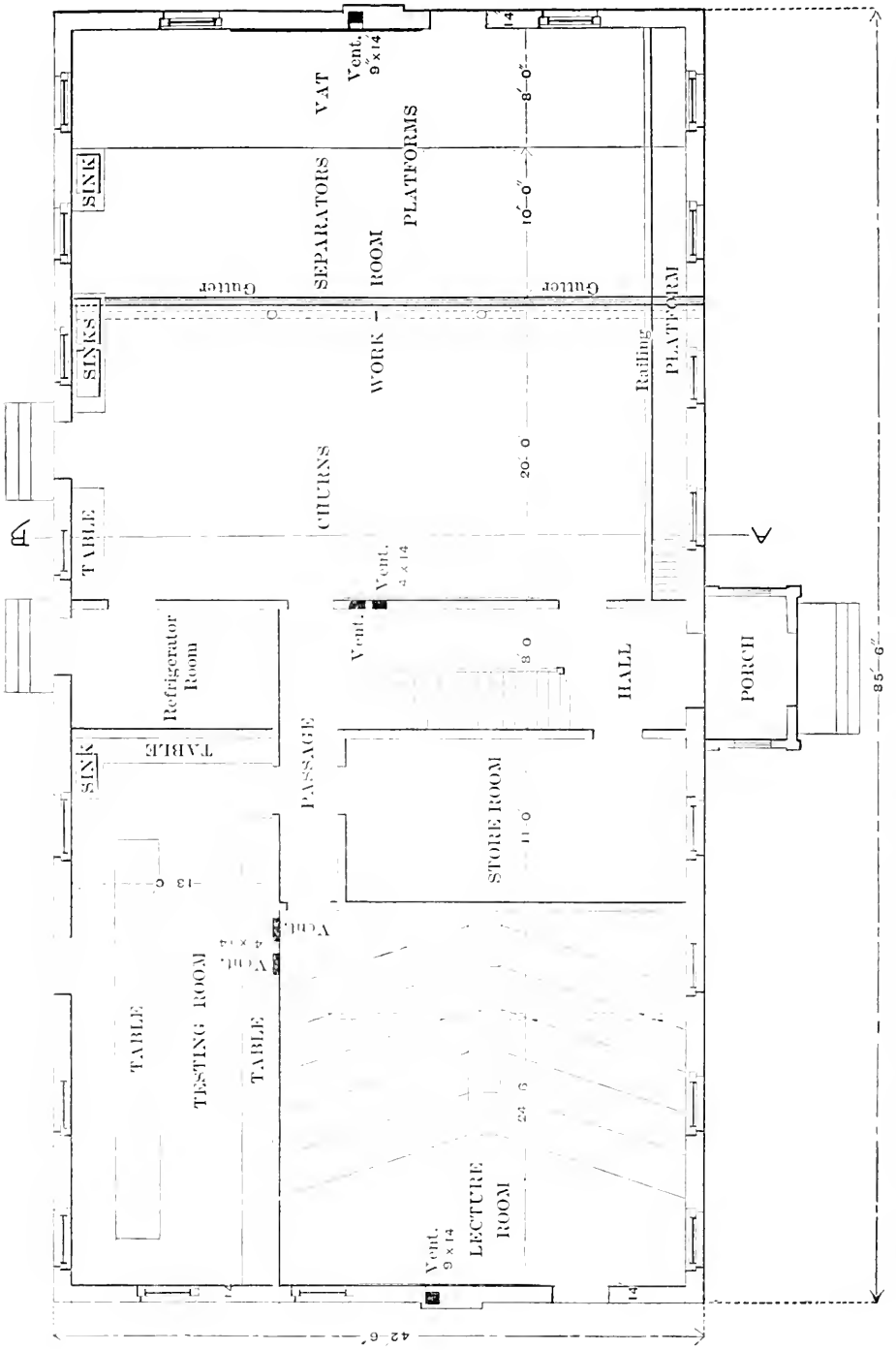
H. H. DEAN,
Prof. of Dairying.

NEW DAIRY BUILDING.

The two cuts herewith included represent the ground floor and a longitudinal section of the new dairy building. The building is of red brick, two stories, and as shown on the plan is fitted up for butter-making, etc. The old building is fitted up for cheese-making and the work in the "Home dairy course." The separating room contains six separators of different makes, the power being supplied from the old dairy building which stands close by. The two buildings are now complete in every respect and thoroughly equipped for dairy work in all its branches.



LONGITUDINAL SECTION.



PLAN OF GROUND FLOOR OF NEW DAIRY BUILDING AT ONTARIO AGRICULTURAL COLLEGE, GUELPH.

APPENDIX I.

GRADUATES, ASSOCIATES, AND COLLEGE ROLL.

1. Bachelors of the Science of Agriculture, Degree of B.S.A.

University of Toronto.

1893—Beckett, H. L.
1893—Bell, L. G.
1890—Brodie, G. A.
1891—Buchanan, D.

1892—Carlyle, W. L.
1891—Cowan, J. H.
1888—Craig, J. A.
1893—Crealy, J. E.
1888—Creelman, G. C.

1893—Day, G. E.
1890—Dean, H. H.
1893—Dyer, W. D.

1893—Eaton, L. W.

1888—Fee, J. J.
1891—Field, H.

1892—Gibson, D. Z.

1889—Harcourt, G.
1892—Harrison, F. C.
1891—Hewgill, E. A., (*ob.*)
1891—Hutt, H. L.
1889—Hutton, J. R.
1892—Hutchinson, J. W.

1889—Lehmann, A.
1891—Linfield, F. B.

1892—Marsh, G. F.
1890—McCallum, W.
1890—Monteith, S. N.
1889—Morgan, J. H. A.
1892—Morgan, R. N.

1892—Newcomen, W. F.

1891—Palmer, W. J.
1888—Paterson, B. E.

1889—Raynor, T.

1890—Shantz, A.
1891—Sharman, H. B.
1893—Shaw, R. S.
1891—Sleightholm, J. A. B.
1893—Story, H.
1889—Soule, R. M., (*ob.*)
1893—Soule, A. M.

1891—Whitley, C. F.

1888—Zavitz, C. A.

2. Associates.

The total number of Associates up to the present time is 262, 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.
1892—†Beckett, H. L.
1892—Bell, L. G.
1888—Birdsall, W. G.
1888—Bishop, W. R.
1889—*Brodie, G. A.
1890—Brown, H. H.
1892—Brown, B. C.
1890—Buchanan, D.
1888—Budd, W.

1885—‡Butler, G. C.
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.
1892—Canaw, W.
1891—Carlyle, W. L.
1884—*Carpenter, P. A., (*ob.*)

1888—Carpenter, W. S.
1892—Carpenter, F. C. S.
1886—Cobb, C.
1880—Chapman, R. K.
1882—Charlton, G. H.
1882—Chase, O.
1879—Clark, J.
1879—Clinton, N. J.
1880—Clutton, A. H.
1893—Cooper, W. W.
1893—Conn, Joseph.
1890—Cowan, J. H.
1890—‡Cowan, R. E.
1887—Craig, J. A.
1892—Crealy, J. E.
1887—Creelman, G. C.
1878—Crompton E.

*Gold Medalist. †First Silver Medalist. ‡Second Silver Medalist.

ASSOCIATES.—*Continued.*

1878—Davis, C. J.
1880—Dawes, M A.
1882—Dawson, J. J.
1892—*Day, G. E.
1888—†Dean, H. H.
1893—Dean, Fred.
1882—Dennis, J.
1889—Derbyshire, J. A.
1881—Dickenson, C. S.
1890—Dolsen, W. J.
1887—Donald, G. C.
1887—Donaldson, F. N.
1877—Douglas, J. D.
1877—Dunlop, S.
1892—Dyer, W. D.

1892—Eaton, L. W.
1890—Elliott, R.
1893—Elmes, W. A.
1888—Elton, C. W.
1888—Elton, R. F.
1882—Elworthy, R. H.
1887—Ewing W.

1878—Farlinger, W. K.
1886—Fee, J. J.
1893—Ferguson, J. J.
1890—Field, H.
1881—File, J.
1882—Fotheringham, J.
1883—‡Fotheringham, W.
1879—Fyfe, A.

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.

1890—Hadwen, G. H.
1891—Haight, W. L.
1882—Hallesy, F.
1893—Hamilton, C. A. W.
1892—Harcourt, R.
1888—*Harcourt, G.
1890—†Harcourt, J.
1887—Harkness, A. D.
1891—Harrison, F. C
1888—Harrison, R. E.
1887—Hart, J. A.
1887—Hart, J. W.
1892—Harvey, W. H.
1893—Hay, L.
1888—Heacock, F. W.
1890—Hewgill, E A., (*ob.*)
1890—Holliday, W. B.
1886—Holtby, R M.
1880—Holtermann, R. F.
1892—Honsberger, J. D.
1882—Horne, W. H.
1888—Horrocks, T. J.
1887—Howes, J. S.
1882—Howitt, W.
1892—Hurley, T. J.
1893—Husband, E. M.
1890—*Hutt, H. L
1888—Hutton, J. R.

1886—Idington, P. S.

1886—Jeffrey, J. S.
1883—Jeffs, H. B.
1879—Jopling, W.

1893—Kennedy, P. B.
1888—Knowlton, S. M.

1882—Landsborough, J.
1887—Leavens, D H.
1893—Lehmann, R. A.
1884—‡Lehmann, A.
1887—‡Lick, E.
1877—Lindsay, A. J.
1889—‡Linfield, F. B.
1887—Livesey, E. M.
1880—Lomas, J. W.
1878—Logan, T.

1880—Macaulay, H.
1890—Macfarland, T. W. R.
1885—Macpherson, A.
1886—*Madge, R. W.
1882—Mahoney, E. C.
1884—Major, C. H.
1889—Marsack, F.
1889—Marsack, H. A.
1891—Marsh, G. F.
1877—Mason, T. H.
1890—McKergow, J. G
1877—Myer, G. W.
1887—Morgan, J. H. A.
1881—Motherwell, W. R.
1885—†Muir, J. B.
1887—McCallum, E. G.
1893—‡McCallum, W.
1889—McCallum W.
1893—McCrimmon, W. D.
1889—McEvoy, T. A.
1885—McIntyre, D. N.
1885—McKay, J B.
1886—McKay, J. G.
1893—McKenzie, W. G.
1891—McKenzie, A. G.
1889—McLaren, P. S.
1893—McMordie, R.
1893—McNaughton, K.
1883—McPherson, D.
1890—Monk, W. D.
1889—Monteith, S. N.
1891—*Morgan, R. N.
1890—Mulholland, F.

1878—Naismith, D. M.
1891—Newcomen, W. F.
1879—Nichol, A., (*ob.*)
1882—Nicol, G.
1882—Notman, C. R.

1877—O'Beirne, A. C.
1887—Orsman, C. P.
1886—Owen, W. H.

1888—Palmer, W. J.
1887—Paterson, B E.
1883—Perry, D. B.
1891—Perry, E. C.
1893—Phin, A. E.
1881—§Phin, R J.
1881—Phin, W. R.
1881—Pope, H.
1886—Power, R. M.
1884—Powys, P. C.

1882—‡Ramsay, R. A.
1879—Randall, J. R.
1885—*Raynor, T.
1885—Reid, P.
1889—Randall, W.
1889—Rennie, E. A.
1883—*Robertson, W.
1879—Robertson, J.

*Gold Medalist. †First Silver Medalist. ‡Second Silver Medalist.
§Winner of the Governor-General's Medal—the only medal given that year.

ASSOCIATES.—*Continued.*

1881—Robins, W. P.
1879—Robinson, C. B.
1893—Roper-Curzon, A C.H.
1892—Roper Curzon, S.
1881—Ross, J. G.
1892—Ruthven, W. A.

1884—Saxton, E. A.
1888—Serson, W. E.
1892—*Shaw, R. S.
1888—Sinclair, J. J.
1882—Silverthorne, N.
1892—Soule, A. M.
1888—Soule, R. M., (*ob.*)
1877—Sykes. W. J.
1883—Schwartz, J. A.
1887—†Scrugham, J. G.
1888—Shantz, A.
1887—Sharman, H. B.
1877—Shaw, G. H.
1882—†Shuttleworth, A. E.
1892—Silverton, C.
1884—†Slater, H., (*ob.*)
1887—*Sleightholm, F. J.
1890—Sleightholm, J. A. B.
1885—Smith, E. P.

1892—‡Soule, A. M.
1891—Sparrow, J. C. H.
1893—Spencer, J. B.
1891—Spencer, W. A.
1884—Steers, O.
1888—Stevenson, C. R.
1893—Stewart, J.
1878—Stewart W.
1892—Story, H.
1882—Stover, W. J.
1886—†Sturge, E.
1888—Sweet, H. R.

1891—Thompson, R. A.
1889—‡Tinney, T H.
1892—Tolton, J. E.
1879—Toole, L.
1883—Torrance, W. J.
1884—Tucker, H. V.
1885—Thompson, W. D.

1888—Valance, R., (*ob.*)

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.
1882—Wettlaufer, F
1891—White, E. F.
1892—Wiancko, A. T.
1891—†Wilkin, F. A.
1879—Wilkinson, J. P.
1888—Willans, T. B.
1888—Willans, N.
1879—Willis, J.
1883—Willis, W. B, (*ob.*)
1888—Wilmot, A. B.
1890—Wilson, F. G.
1882—White, C. D.
1879—White, G. P.
1890—Whitley, C. F.
1890—Wood, W. D.
1884—Wroughton, T. A.

1892—Yuill, A. R.

1886—Zavitz, C. A.

* Gold Medalist. † First Silver Medalist. ‡ Second Silver Medalist.
§ Winner of the Governor-General's Medal—the only medal given that year.

3. COLLEGE ROLL FOR 1893.

Third Year Students.

Name.	P. O. Address.	County, etc.
Aylsworth, D	Bath	Lennox, Ont.
*Beckett, H. L	Hamilton	Wentworth, Ont.
*Bell, L. G	Qu'Appelle Station	Assa, N. W. T.
Brodie, C. J., B.S.A	Bethesda	York, Ont.
†Brown, W. J	Dunboyne	Elgin, Ont
Burns, J A. S	Halifax	Nova Scotia.
†Burns, J. H	Kirkton	Huron, Ont.
Carpenter, F. C. S	Rat Portage	Rainy River District, Ont.
*Crealy, J. E	Strathroy	Middlesex, Ont.
*Day, G. E	Guelph	Wellington, Ont.
*Dyer, W. D	Columbus	Ontario, Ont.

*Obtained the degree of B.S A. in June.
†Received an Associate Diploma in June.

3. College Roll for 1893.

Third Year Students.—Continued.

Name.	P. O. Address.	County, etc.
Eaton, L. W	Dartmouth	Nova Scotia.
†Ferguson, J. J	Smith's Falls	Leeds, Ont.
Graham, W. R	Belleville	Hastings, Ont.
Hamilton, C. A. W	Leamington-Hastings	Rugby, England.
†Kennedy, P. B	Sarnia	Lambton, Ont.
†McCallum, Wm	Guelph	Wellington, Ont.
Roper-Curzon, S	London	England.
*Shaw, R. S	Guelph	Wellington, Ont.
Sleightholm, F. J	Brampton	Peel, Ont.
*Soule, A. M	Niagara Falls South	Welland, Ont.
†Spencer, J. B	Brooklin	Ontario, Ont.
Story, H	Picton	Prince Edward, Ont.

Second Year Students.

Atkinson, Jno	Seaforth	Huron, Ont.
Atkinson, Jas	Seaforth	Huron, Ont
Brooks, W. C	Brantford	Brant, Ont.
Buchanan, Jno	Hensall	Huron, Ont.
Caldecott, F	Toronto	York, Ont.
Carrick, C. S	Kincardine	Bruce, Ont.
Christian, A. H	Danforth	York, Ont.
Conn, Joseph	Heathcote	Grey, Ont.
Cook, J. H	Gordonville	Wellington, Ont.
Cooper, W. W	Kippen	Huron, Ont.
Dean, F	Harley	Brant, Ont.
Doherty, W. M	Eglinton	York, Ont.
Duffett, G. P	Adolphustown	Lennox, Ont.
Elliott, Wm	Galt	Waterloo, Ont.
Elmes, W. A	Princeton	Brant, Ont.
Findlay, J. H	Barrie	Simcoe, Ont.
Fitzgerald, J. P	Mount St. Louis	Simcoe, Ont.

* Obtained the degree of B.S.A. in June.

† Received an Associate Diploma in June.

3. College Roll for 1893.

Second Year Students—Continued.

Name.	P. O. Address.	County, etc.
Graesser, F. A	Llangollen	North Wales.
Harvey, T. B	Charing Cross	Kent, Ont.
Hay, L	Ruda Guzowska	Poland.
Henderson, R. H	Rockton	Wentworth, Ont.
Heward, A. D	Toronto	York, Ont.
High, A. M	Beamsville	Lincoln, Ont.
Husband, E. M	Cairngorm	Middlesex, Ont.
James, D. A	Nilestown	Middlesex, Ont.
Kennedy, W. A	Apple Hill	Glengarry, Ont.
Kidd, D. F	Cookstown	Simcoe, Ont.
Lailey, F. T	Toronto	York, Ont.
Laird, J. G	Sarnia	Lambton, Ont.
Lehmann, R. A	Orillia	Simcoe, Ont.
Millichamp, R. W	Toronto	York, Ont.
Maclean, R. R	Stanley House	Parry Sound District, Ont.
McCrimmon, W. D	Glen Roy	Glengarry, Ont.
McKay, W. E	Prince Albert	North West Territory.
McKenzie, W. G	Fairview	Oxford, Ont.
McMordie, R	Kippen	Huron, Ont.
McNaughton, K	Walkerton	Bruce, Ont.
Phin, A. E	Hespeler	Waterloo, Ont.
Reinke, C. E	Ancaster	Wentworth, Ont.
Robertson, G. A	Kingston	Frontenac, Ont.
Roper-Curzon, A	London	England.
Shorey, S. C	Harrowsmith	Addington, Ont.
Simpson, A. E	Hamilton	Prince Edward Island.
Smyth, F. L	Tormore	York, Ont.
Stewart, Jacob	Snake River	Renfrew, Ont.
Thompson, Walter J	Edgar	Simcoe, Ont.
Traviss, C. H	Holt	York, Ont.
Vipond, J. M	Donegal	Perth, Ont.
Walker, F	Norwich	Oxford, Ont.
Wheatley, Jno	Blackwell	Lambton, Ont.
Widdifield, J. W	Siloam	Ontario, Ont.
Wilson, E. E	Brampton	Peel, Ont.
Wood, R. S	Walton-on-Thames	Surrey, England.

3. College Roll for 1893.

First Year Students.

Name.	P. O. Address.	County, etc.
Ainley, W	Barrie	Simcoe, Ont.
Aylen, C. S. F	Southsea	England.
Balfour, T. B	Amherstburg	Essex, Ont.
Bard, A. L	Bardsville	Muskoka, Ont.
Bowker, C. G	Bedford	England.
Brent, A. H	Tyrone	Durham, Ont.
Brown, Robt	Hermitage	Dalbeattie, Scotland.
Bruneau, A. E	Montreal	Quebec.
Burdett, A. H	Nr. Bristol	Somerset, England.
Butler, E	Dereham Centre	Oxford, Ont.
Campbell, W. G	Brantford.	Brant, Ont.
Carlyle, S. G	Chesterville	Dundas, Ont.
Cass, L. H	L'Orignal	Prescott, Ont.
Chadsey, G. E	Sumas	British Columbia.
Clark, J. F	Bay View	Prince Edward Island.
Clunn, W. P	Prestwich	Manchester, England.
Clunn, H. E	Prestwich	Manchester, England.
Comfort, J. H	Tintern	Lincoln, Ont.
Cowieson, W. R	Queensville	York, Ont.
Day, A. H	Guelph	Wellington, Ont.
DeHart, E. F. R	Whitby	Ontario, Ont.
DeHart, R. A	Creighton	Simcoe, Ont.
Dunn, E	Plover Mills	Middlesex, Ont.
Edelsten, E. J. M	London	England.
Elmes, J. H	Princeton	Brant, Ont.
Emigh, G. C	Holbrook	Oxford, Ont.
Evans, A. R	Newmarket	York, Ont.
Fee, F. W	Toronto	York, Ont.
Garbutt, R. A	Peterboro'	Peterboro', Ont.
Gilleland, H. C	St. Catharines.	Lincoln, Ont.
Gillespie, C. A	Toronto	York, Ont.
Gouin, B	Ilderton	Middlesex, Ont.
Grantham, H. V	Mohawk	Brant, Ont.
Hallett, F. T	Weymouth	Dorset, England.
Harvard, H. F	Parkdale	York, Ont.
Hovell, D. B	Elstree	Herts, England.
Humphry, G. F	Sussex	England.
Hunter, H. E	Pembroke	Renfrew, Ont.
Jardine, J. E. A	Prince Albert	North West Territory.
Kennedy, W. D	Vernon	Dundas, Ont.
Kewley, H. D	Sarnia	Lambton, Ont.

3. College Roll for 1893.

First Year Students—Continued.

Name.	P. O. Address.	County, etc.
King, A. A	Johnston's Crossing	Nova Scotia.
King, W. A	Decewsville	Haldimand, Ont.
Kipp, A	Chilliwack	British Columbia.
Kippen, N	Underwood	Bruce, Ont.
Knight, Joshua	Elginburg	Frontenac, Ont
Lang, L. W	St. Marys	Perth, Ont.
Leonard, S. E	Woodford	Grey, Ont.
Lewis, George	Ballymote	Middlesex, Ont.
Logie, A. W	Montreal	Quebec.
Merritt, L. A	St. Catharines	Lincoln, Ont.
Mey, W. B	Leipsig	Germany.
Miller, R. C	Burlington	Halton, Ont.
Millson, A	Solina	Durham, Ont.
Mitchell, S	Brampton	Peel, Ont
More, Jas	Kirkton	Perth, Ont.
McCallan, E. A	St. Davids	Bermuda.
McCullough	Nantye	Simcoe, Ont.
Maconachie, G. R. B	Gurdaspur	Punjab, India.
Macdonald, W. A	Tracadie	Prince Edward Island.
Macdonald, A. N	Toronto	York, Ont.
McDonald, R	Alexandria	Glengarry, Ont.
McDonald, N	Russell	Russell, Ont.
McDougall, D. H	Martintown	Glengarry, Ont.
Macfie, C. M	Appin	Middlesex, Ont.
McGillivray, J. W	Sumas	British Columbia.
McKay, Robt	Braemar	Oxford, Ont.
McKenzie, R. V	Lucknow	Bruce, Ont.
McKinley, W. W	Seeley's Bay	Leeds, Ont.
Maclennan, J. F	Hoath Head	Grey, Ont.
McMillan, G. D	Greenbank	Ontario, Ont.
McPhail, J. D	Vernon	Carleton, Ont.
McPherson, D. J	Lancaster	Ontario, Ont.
Nelles, N. C	Grimsby	Lincoln, Ont.
Newman, W. M	Gilbert's Mills	Prince Edward, Ont.
Payne, G. Y	Peterboro	Peterboro, Ont.
Patterson, T. F	Lucknow	Bruce, Ont.
Pettit, F. E	Burgessville	Oxford, Ont.
Ponting, E	Moweaqua	Illinois, U. S. A
Pullin, J. H	Sweaborg	Oxford, Ont.
Rathwell, W	Ferguson's Falls	Lanark, Ont.
Rice, T. L	Toronto	York, Ont.
Rive, E	Guelph	Wellington, Ont.
Robinson, H. G	Delgany	Wicklow, Ireland.
Ross, T. E	Barrie	Simcoe, Ont.

3. College Roll for 1893.

First Year Students—Continued.

Name.	P. O. Address.	County, etc.
Scott, W. F.	Milton	Halton, Ont.
Shotwell, W. M	Poplar Hill	Middlesex, Ont.
Silcox, C. P.	Embro	Oxford, Ont.
Smith, P. B.	Hamilton	Bermuda.
Smith, C. F.	Shirley	Southampton, Eng.
Snider, P. A	Bloomingdale	Waterloo, Ont.
Struthers, J. B	Underwood	Bruce, Ont.
Summerby, W. L	Russell	Russell, Ont.
Taylor, W. H	Peterboro	Peterboro, Ont.
Thom, W. E	Morrisburg	Dundas, Ont.
Thompson, Wm. J.	Barrie	Simcoe, Ont.
Thompson, J. A	Thornton	Simcoe, Ont.
Thomson, B. T	Colinton	Scotland.
Thomson, E. D	Barrie	Simcoe, Ont.
Turnbull, W. J. E	Atwood	Perth, Ont.
Tye, C. W	Haysville	Ontario, Ont.
Wallbridge, J. S.	Belleville	Hastings, Ont.
Watson, J. H.	Brampton	Peel, Ont.
Werry, M. J	Tyrone	Durham, Ont.
Westover, M	Frelighsburg	Quebec.
Wilson, A. C	Greenway	Huron, Ont.
Wilson, N. F	Rockland	Russell, Ont.
Wilson, G. H	Toronto	York, Ont.
Woolley, D. M	Simcoe	Norfolk, Ont.
Woolverton, T. N	Grimsby	Lincoln, Ont.

APPENDIX II.

SYLLABUS OF LECTURES.

Lectures began as usual on the 1st October, 1892, and continued with the omission of the Christmas vacation, until the 30th June, 1893, which latter date was the end of the scholastic year 1892-93.

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 22nd December.

Agriculture.

Introductory. Ancient and modern agriculture ; agricultural literature : different systems of farming ; history of agriculture.

Soils. Their formation and composition, physical and chemical properties, etc. ; examination and classification of soils ; cultivation of soils, including various tillage operations—plowing, harrowing, cultivating, rolling, etc.

Land Drainage. Method of laying out drains ; various kinds of drains and their construction ; different modes of draining.

Rotation of Crops. Importance and necessity of rotation ; principles underlying it ; rotations suitable to different kinds of soil ; examination and criticism of different systems of rotation.

Cattle. Pointing out and naming the different parts of the animal ; characteristic points and pecularities of the principal beef and dairy breeds of cattle ; practical handling of beef and dairy animals.

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, natures 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 different 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 animals connected with agriculture.

VETERINARY SCIENCE.

Anatomy and Physiology of the horse, ox, sheep and pig ; osseous system, muscular system, syndesmology, plantar system and odontology.

ENGLISH.

Composition. Review of Grammar, with exercises on capital letters and punctuation.

Literature. Selections from Tennyson.

MATHEMATICS.

Arithmetic. Review of subject, with special reference to farm accounts. Interest, discount, stocks, and partnership.

Mental Arithmetic. Calculations in simple rules.

Book-keeping. Subject commenced.

Winter Term.—22nd January to 16th April.

AGRICULTURE.

Manures. Composition, management, and application of farmyard manure ; artificial fertilizers—their composition, uses, and modes of application ; mechanical and chemical effects of manures on various kinds of soil and crops ; the amounts to apply, etc. ; green manures.

Crops for Soiling. The advantages of soiling ; the principal soiling crops ; feeding of green crops to live stock.

The Weeds of the Farm. The most troublesome weeds described, and different modes of eradicating them.

Sheep. Characteristic points of medium and long wool breeds, and practical handling of same.

NATURAL SCIENCE.

Inorganic Chemistry (Continued). Carbon ; combustion ; carbonic acid and its relation to the animal and vegetable kingdom ; sulphur and its compounds ; manufacture and uses of sulphuric acid ; phosphorous ; phosphoric acid and its importance in agriculture ; chlorine—its bleaching properties ; bromide ; iodine ; silicon ; potassium ; calcium ; magnesium ; iron, etc.

Organic Chemistry. Constitutions of organic compounds ; alcohols ; aldehydes, acids and their derivatives ; formic, acetic, oxalic, tartaric, citric, lactic, malic, uric, and tannic acids. Constitution 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. Critical study of selections from Tennyson.

MATHEMATICS AND BOOK-KEEPING.

Arithmetic. Equation of payments; percentage; profit and loss; stocks; partnership; exchange.

Book keeping. Rusiness forms and correspondence; general farm accounts; dairy, field and garden accounts.

Spring Term.—17th April to 30th June.

AGRICULTURE.

Preparation of Soil. Modes of preparation for different crops, and various kinds of soil.

Seeds and Sowing. Testing the quality of seed; changing seed; quantity per acre; and methods of sowing.

The Crops of the Farm. Their growth and management—hay, rye, wheat, barley oats, peas, buckwheat, potatoes, turnips, mangels, sugar beets, rape, etc.

Pastures. Growth and management of pastures; temporary and permanent pastures.

Feeding of Live Stock. General outline of the principles of feeding different kinds of stock.

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. Authorized Grammar.

English Classics. Critical study of selections from Wordsworth.

MATHEMATICS.

Mensuration. Mensuration of surfaces—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.

SECOND YEAR.

Fall Term—1st October to 22nd December.

AGRICULTURE.

Cattle. Origin and history of the leading breeds of cattle in America; beef breeds—their leading characteristics and principal points: dairy breeds—their leading characteristics and principal points; practical handling and judging of cattle.

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 during the decomposition of the bodies of animals at death; the functions of animals and plants contrasted; food of plants, and 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. Ontario as a fruit growing country; the natural divisions into which it may be divided for growing fruit; detailed account of the operations, layering, grafting, budding, pruning, etc.; laying out and cultivation of an orchard; list of fruits best suited for general purposes, with best methods for their cultivation; remarks on gardening as a source of profit; plants best adapted to bedding and potting.

Lectures illustrated by practical work in the garden, and specimens in the class-room.

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 of flesh-wounds, etc.

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 the teeth, and treatment of the same.

ENGLISH.

English Classics. Critical study of Shakespeare's "Julius Cæsar."

MATHEMATICS.

Dynamics. Motion, forces producing motion, momentum; work, the simple machines, etc.

Winter Term—22nd January to 16th April.

AGRICULTURE.

Sheep. Origin and history of the leading breeds of sheep in Britain and Americoa; coarse, medium and fine wooled sheep—their leading characteristics and principal points; practical handling and judging of sheep.

Swine. Origin and history of the leading breeds of swine in Britain and America; large and small breeds of swine—their leading characteristics and principal points; practical handling and judging of swine.

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.

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, string-halt, etc.

Sensitive System. Nature, causes, symptoms, and treatment of the diseases 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 "King Lear."

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.

MATHEMATICS.

Statics. Theory of equilibrium; composition and resolution of forces; parallelogram of forces; moments; centre of gravity, etc.

Hydrostatics. Transmission of pressure; the hydraulic press; specific gravity; density; pumps, siphons, etc.

Book-keeping. Review of previous work.

Spring Term—17th April to 30th June.

AGRICULTURE.

Breeding. Outline of the general principles of breeding.

Feeding. Feeding standards; feeding for growth, meat, milk, quality of milk, etc.

Care and management of cattle, sheep and swine; care at different periods of growth, at different seasons, and under varying conditions.

NATURAL SCIENCE.

Determinations 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; adulterations 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.

Green-house Plants. Special study of all plants grown in our green-houses, and the shrubs, etc., on the lawn.

VETERINARY SCIENCE.

Materia Medica. The preparation, actions, uses, and doses of medicines—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 puberty, œstrum, gestation, sterility, abortion, normal and abnormal parturition. Diseases incidental to pregnant and parturient animals.

ENGLISH.

English Classics. The critical study of Milton's "L'Allegro" and "Il Penseroso."

MATHEMATICS.

Surveying and Levelling. Fields surveyed with chain and cross-staff; measurements of heights.

Road making. Determination of proper slopes; shape of road bed; drainage of roads; friction on different roads; various road coverings; the maintenance of roads; cost, etc.

THIRD YEAR.

FIXED WORK.

CHEMISTRY. The work in this department comes under four heads, each of which forms the basis of a separate examination.

General Chemistry, Organic and Inorganic. Roscoe's "Lessons in Elementary Chemistry" (1886 edition), with a course of lectures. Most stress laid on those elements and compounds which have an agricultural bearing; laws and theories of chemistry discussed.

Agricultural Chemistry. "Chemistry of the Farm" (Warington), and "Agriculture in some of its Relations with Chemistry" (Storer), with lectures, Vol. I Chapters, 1, 2, 3, 4, 7, 8, 9, 10, 11 and 12; Vol. II, Chapters, 5, 6, 7, 8, 9, 10, 15, 17, 18 and 19.

Animal Chemistry and Cattle Feeding. "Manual of Cattle Feeding" (Armsby), with lectures.

Analytical Chemistry. Qualitative and Quantitative Analysis of soils, fertilizers, agricultural products, etc

NATURAL HISTORY. Four examinations, as follows:

Zoology. Differences between plants and animals; parasitic animals, especially those injurious to farm animals; animals which have assisted in the formation of soil; insectivorous birds, etc.

Economic Entomology. Classification of insects; characters of orders into which insects are divided; 75 insects injurious to vegetation, and the best means of destroying them; insecticides—their uses and modes of application.

Structural and Physiological Botany. Cells and tissues of plants; reproduction, assimilation, absorption, and metabolism of plants; processes of fertilization and hybridization; plants in relation to soil; classification of plants and study of the most important orders; analysis of plants; examination of specimens in herbarium, and illustrations by magic lantern.

Economic Botany. Special reference to injurious fungi and weeds.

MICROSCOPY. Manipulation of microscope; methods of mounting specimens; drawing and measuring objects under microscope; microscopic study of the structure of plants and other objects. Hillhouse pp. 1-35, and appendix IV.

DRAWING. Freehand and mechanical drawing, especially the drawing and construction of farm houses, barns, stables, etc.,—ground plans, elevations, sections, and construction.

ENGLISH. (1) Grammar (High School Grammar). (2) Composition and Rhetoric (Bain). (3) Outlines of English Literature (Lectures with Spalding and Craik). (4) Themes. (5) Critical reading of the following selections:

Shakespeare—Richard II.

Bacon—Essays: Of Studies, Great Place, Boldness, Goodness and Goodness of Nature, Youth and Age, Discourse, Friendship.

Milton—Lycidas and Paradise Lost, Bk. 1.

Pope—Essay on Criticism.

Addison—Spectator, Nos. 23, 26, 47, 93, 115, 162, 225, 381, 387, 483, 583, 598.

Wordsworth—The Solitary Reaper; Intimations of Immortality; Resolution and Independence.

Macaulay—Essay on Lord Bacon.

DeQuincey—William Wordsworth.

Tennyson—Locksley Hall; In Memoriam, i-xxvii.

Note—In order to pass this department, it is necessary, above everything else, that the candidate know how to spell correctly and be able to write good English.

OPTIONS.

Three of the following subjects must also be taken, in addition to the fixed work prescribed above.

1. *Agriculture.* (1) Principles and practice of general agriculture; "Agriculture in some of its relations with Chemistry" (Storer), Vol. I., Chapters 5, 6, 13, 14, 15, 16, 18, and Vol. II., Chapters 1, 2, 3, 4, 11, 12, 13, 14, 16, 20, 21, 22; (2) Characteristic points of the most valuable breeds of horses, cattle, sheep, and pigs; "History of Polled Aberdeen or Angus Cattle" (Macdonald and Sinclair), Chapters I—V; "History of Hereford Cattle" (Macdonald and Sinclair), Chapters I and X; (3) Construction and arrangement of farm buildings with a view of cheapness, economy of space, and convenience.

2. *Dairying.* (1) "Dairy Farming" (Sheldon), Chapters 1-6, 11-15, 19, 33, 34; (2) "American Dairying" (Arnold); (3) "Scientific Dairy Practice" (Lynch); (4) Milch Cows" (Flint); (5) "Dairyman's Manual" (Stewart); (6) "Reports of Dairy Associations of Ontario," 1887, pp 21-63, 66-68, 99-107, 125-146, 156-174, 177-205, 213-249; 1888, pp. 7-11, 15-17, 21-24, 51-59, 114-128, 143 156, also subsequent reports to date; (6) "Analysis of Foods" (Blyth), pp. 194 218, 228-246, 251-280, 283-293, 305-313.

3. *Geology.* A general review of the subjects; special reference to the various systems and formations found in Canada, particularly the Geology of Ontario, New Brunswick, Nova Scotia, Manitoba and the Northwest; economic products in Canadian rocks; chief agents in the disintegration of rocks; a thorough study of the origin and formation of soil.

4. *Algebra.* Through quadratic equations.

5. *Euclid.* Books I and II, with simple deductions.

6. *Latin.* Principia Latina, part I, 1—XXXIII, with a view to learn the pronunciation of scientific terms, and those Latin roots from which a large number of English words are derived.

Books of Reference in Botany, etc. Entomology (Comstock); Injurious Insects (Saunders); Bound Reports Entomological Society; Structural Botany (Gray), Physiological (Vines); Systematic (Gray's Manual and Spotton, part II.); Injurious Fungi (Smith); Weeds (Stock Journal '88); Practical Botany (Hillhouse); Microscope (Phin); Microscope and Botany (Behrens).

APPENDIX III.

EXAMINATION PAPERS.

I. Papers set at Easter Examinations, 1893.

FIRST YEAR.

Agriculture.

I. State the chief of the influences which affect the quality of farmyard manure.

II. State the chief of the advantages to be derived from growing green manures. Name the crops that may be grown as green manures in Canada in the order of their value.

III. Name the principal sources from which the nitrogen in commercial fertilizers is derived. At what season of the year may it be best applied?

IV. What is meant by superphosphate? Give the chief of the rules which should govern the application of superphosphate.

V. Show wherein the rotation of crops improves the texture of the soil. Give a rotation adapted to stiff clays.

VI. Show wherein soiling effects a saving in food. What combination of spring grains do you consider the most suitable to grow as a soiling crop, and how would you manage such a crop.

VII. Mention the soils most suitable for growing rye. Where would you place rye in the rotation?

VIII. State briefly what you know as to the origin of the pea, and give the mode or modes of preparing the soil for a crop of peas.

IX. When would you sow wheat, rye, barley, oats, peas? Mention the quantities of seed to be used per acre.

X. How are the different varieties of turnips distinguished? Give your mode of preparing the land for a crop of mangels.

Chemistry.

I. (*a*) Express by a chemical equation the decomposition which Potassium Chlorate undergoes when mixed with Manganese Dioxide and heated.

(*b*) What weight of Oxygen may be obtained from 21 grams of $KClO_3$ (K = 39, Cl = 35.5, O = 16)?

II. Lead exposed to the air and heated, melts, changes to powder, and increases in weight. Lead melted in the absence of air does not change or increase in weight. Draw conclusions regarding the composition of the air from these facts.

III. What is meant by a natural law? Such a law is illustrated by the five oxides of nitrogen. Name this particular law and explain the illustration.

IV. How may Chlorine gas be obtained from common salt?

V. Define the following: Acid, base, salt, metal, non-metal, normal salt, acid salt, and acid hydrogen.

VI. A mixture of CuO and C is heated ; express by an equation the chemical change which occurs, giving experimental evidence.

VII. Finish the equations :

$NH_4Cl + KOH =$
$2NH_4Cl + Ca(OH)_2 =$
$2HNO_3 + Cu =$
$2HNO_3 + 6H =$

VIII. Flask (*a*) contains copper and dilute nitric acid, (*b*) copper and concentrated sulphuric acid, and (*c*) contains water ; (*b*) and (*c*) are warmed gently ; and the products of (*a*), (*b*), and (*c*) together with a current of air, are conducted into flask (*d*).

(1) Explain by equations the chemical changes occurring in flasks (*a*), (*b*), and (*d*).

(2) By what means can it be shown that sulphuric acid has been prepared ?

IX. (*a*) Name the natural sources of phosphoric acid.

(*b*) Express by an equation the action of sulphuric acid upon ground apatite in the preparation of superphosphate of lime.

X. (*a*) Give the formulas of the alcohols, aldehydes and acids corresponding to methane propane, hexane, and decane.

(*b*) What is the action of potassium hydroxide upon palmitic acid ?

Zoology.

I. "Some animals have exerted considerable influence in the formation of soil." To what extent is this true, and what animals are likely referred to ?

II. What characters are observed in forming a classification of animals ? Classify rat, oyster, emu, duck, bat, trilobite, whale, dog, frog and tape-worm.

III. Name some of the organs of defence in the animal kingdom, and explain the terms mimicry, hybernation and alternation of host.

IV. Describe the breathing organs of a beaver, fish, and butterfly.

V. Name some of the most common parasites which affect animals, and state how their evil effects to some extent may be prevented.

VI. Illustrate what is meant by distribution in space and time by referring to the class ; birds, fishes and elephants.

VII. Outline the metamorphosis of an insect, and give diagrams in illustration.

VIII. Describe a sea urchin.

Anatomy.

I. Name the functional processes of digestion.

II. State the number, kinds and arrangement of teeth you would expect in a horse three years old.

III. Describe the trachea.

IV. Name the urinary organs in the female.

V. State the functions of the kidneys.

VI. Describe the wall of the hoof.

VII. State the functions of the liver and the manner in which its secretion enters the intestine.

VIII. Trace the urine from the kidneys until it is expelled from the body in the male.

English Grammar.

I. "Where he was born cannot be ascertained." Analyze and parse this sentence.

II. Give the plural of *beau*, *criterion*, *deer*, *larva*, and *canto*.

III. How do we form the possessive case of nouns and the comparative degree of adjectives in English?
(*a*) Compare *least*, *worst*, and *happy*.
(*b*) Distinguish the *Saxon* and *Norman* possessives, and state the use of the former in modern English.

IV. How would you draw special attention to a word or phrase in a sentence? Give an example.

V. What is meant by a participle? How many participles has an English verb, and what are the uses of each?

VI. Name the *auxiliary verbs* and state briefly the uses of each?

VII. Give the principal parts of *knit*, *durst*, *sought*, *bid*, *gone*, *hung*, *swim*, and *bear*.

VIII. Quote the rules for the uses of the *colon* and the *semi-colon*.

IX. Correct any errors which you may find in the following sentences, giving reasons:
(1) Them hats hadn't ought to be laying there.
(2) He has went without his mits and I am afraid his hands will be froze.
(3) If this continues, I will lose all my property.
(4) Will I bring you the axe?
(5) Give every word and syllable their proper sound.
(6) Neither of us are willing to give up our claim.
(7) Let you and I go, Tom can stop here.
(8) Was you there last night. Me and Jennie were.

Literature.

I. Write notes upon Wordsworth's power of describing scenery. 15.

II. From any of the poems read, quote two passages of at least five lines each. 10.

III. Explain fully (and note the connection of) the following:
(*a*) " . . . blood cries out for blood."
(*b*) " . . . fears and fancies thick upon me came."
(*c*) " . . . . . a huge recess
That keeps till June, December's snow."
(*d*) "Not in entire forgetfulness"
"And not in utter nakedness."
(*e*) "Whither is fled the visionary gleam?"
"Where is it now, the glory and the dream?" 10.

IV. Explain the connection between the title "Resolution and Independence," and the matter of the story." 5.

V. Explain fully the following:
"She leaves those objects to a slow decay
That what we are, and have been, may be known;
But, at the coming of the milder day,
These monuments shall all be overgrown." 10.

VI. Write explanatory notes on
(*a*) " . . . . . doth a leaping fish
Send through the tarn a lonely cheer."
(*b*) "The crags repeat the raven's croak
In symphony austere."
(*c*) "The heavens laugh with you in your jubilee."
(*d*) "The sleepless soul that perished in his pride." 10.

VII. Wherein lies the beauty or want of beauty (from a poetic standpoint) in:
(*a*) "As a huge stone is sometimes seen to lie
Crouched on the bald top of an eminence."
(*b*) "And with her feet she from the plashy earth
Raises a mist; that, glittering in the sun
Runs with her all the way . . ."
(*c*) " . . . . . the man perceives it die away,
And fade into the light of common day." 20.

VIII. What were Wordsworth's ideas about a life previous to this one? Upon what did he base his opinions?

IX. Explain (1) Transferred Epithet. (2) Simile. (3) Prosy style. (4) Rhyme. 10.

Arithmetic.

I. What sum in 2 yrs. 6 mos. at $4\frac{1}{2}$ per cent. will amount to $849.95?

II. Find the L.C.M. of 5 square links and 2 square feet.

III. What is the difference in cubic feet between .062 of a cord and 1-17 of 2,164 cubic inches. 1-54 of half a cubic foot?

IV. In Nov., 1890, I had 424 bushels of wheat. Had I sold then I could have got 84c. per bushel. I could have put the proceeds out at 4 per cent. interest. I kept the wheat and sold six months later for 87c. Did I lose or gain by holding it, and how much?

V. A walks 4 miles per hour; B $3\frac{1}{2}$. They are 100 yards apart and walk towards each other. How far has B gone when they meet?

VI. In a hundred yards, A can give B four yards start and C five yards, and all finish together. If B gave C one yard start in 100, which would win? Show your reasons for answer.

VII. Reduce 1-21,000 of a ton to oz.
(*b*) If 25 quarts equal 1 cubic foot, express 1 pint in cubic yards.
(*c*) How many square yards in one acre?
(*d*) How many pounds in a bushel of oats? of peas? of barley?

VIII. Two persons, starting from the same place and travelling in opposite directions, are forty miles apart at end of two hours, but travelling in same direction they are nine miles apart at end of one and a half hours. Find the rate per hour at which each travels.

Mensuration.

I. Define (*a*) Quadrilateral. (*b*) Right-angled Triangle. (*c*) Rhombus. (*d*) Cone. (*e*) Cylinder. (*f*) Parallelopipedon.

II. A cow is tied to a fence, by a rope. She has access to $\frac{1}{4}$ of an acre. How long is the rope?

III. A piece of plate-glass is 9 x 7 feet and $\frac{1}{3}$ inch thick. How many panes (18 x 13 inches and 1-10 inch thick) will contain the same bulk of glass?

IV. A triangular field has a perimeter of 918 yards. The sides are in the ratio of 2, 3 and 4. Find area of the field in acres.

V. A cylinder has a circumference of 132 feet, and a height of 19 feet. Find the volume of a *cone* half the height. (The cone has same area of base as the cylinder.)

VI. State rules for finding (*a*) Volume of a pyramid. (*b*) The hypothenuse of a right-angled triangle, if the sides be given. (*c*) Surface of a cylinder, ends included.

VII. In computing the capacity of the dairy silo, what measurements would you require?

VIII. State the surface of board fencing in a close-boarded fence six feet high (1) Around a square enclosure of 1,849 sq. yards. (2) Around a circular enclosure of 41 feet diameter.

IX. If three sides of a plot of ground be in the position of three sides of a rectangle, and the fourth side be a curve, show a method of determining the area.

X. Find the amount of gravel on a path around the outside of a rectangular lot 90 yards by 36 yards. The path is 4 feet wide and gravelled $2\frac{1}{2}$ feet deep.

Book-Keeping (Set at Christmas).

I. Define the terms "Day Book;" "Ledger Account;" "Trial Balance;" "Bills Receivable;" "Loss and Gain Account."

II. In a set of farm accounts, enter the following items in the Day Book: Jan, 8, Had repairs made to plow, $2.80; Jan. 9, Bought groceries, $10.40; Exchanged butter and eggs, $4.10, and paid balance in cash; Feb. 14, Bought a horse, value $120. Gave in exchange a plow (valued at $10), cash $60, balance in a note at 3 months; Feb. 26, Sold 40 bush. oats a 45c per bush.; Bought a new mower, paying cash, $14.

III. Journalize the same entries.

IV. Your "Bills Payable" account in the Ledger stands thus: Dr. side—May 7, To bank, $87; May 24, To bank, $28; June 8, To cash, $14. Cr. side—May 9, By live stock, $147; June 17, By farm implements, $104; By expense, $21.20. Write down the account as it stands, and show what addition would be made when it is closed. Into what account if "Bills Payable" closed?

V. Into what accounts are the following closed: Bank, Cash, Household Furniture, Produce and Feed, Expense, Labor, Field No. 5.

VI. I open my farm accounts. My first Ledger entry shows Live Stock debited and Cash credited. How will this item stand in the Journal? Make a Day Book item to correspond.

VII. What does the difference between the Dr. and Cr. sides of the capital indicate when the books are closed? Into what account in the Ledger does the Loss and Gain go at closing?

VIII. John Smith sells Thomas Jones a cow for $40. Write for the transaction (1) A promissory note at six months, (2) an accepted draft, (3) a cheque (payable to self or order) on Dominion Bank.

SECOND YEAR.

Agriculture.

I. Compare the middle-wooled breeds of sheep imported into America (1) in regard to quality of fleece as coarse or fine, (2) with reference to the quantity of the wool clip, and (3) as to the weight of the carcase.

II. Define what is meant by the term "fibre" in wool. Why is it important that the fibre should be strong? Name the chief of the influences that affect the strength of the fibre?

III. Give the chief of the distinguishing properties of Southdown sheep.

IV. Compare the three principal coarse-wooled breeds of sheep in America with reference (1) to general outline, (2) to color, and (3) wool clip.

V. Would it be desirable to have Dorset Horned sheep breed twice a year in Canada? Give the reasons for your view. What part should they play in crossing upon other breeds?

VI. In which portions of the earth have swine been found in a wild state? What is the relation between wild and domesticated swine? Give the reasons.

VII. Trace the origin of the middle and Small Yorkshire breeds respectively. What obstacles stand in the way of the former being more generally diffused at the present time?

VIII. Sketch the history of Cheshire swine.

Practical Cattle.

I. Mention the points in which you consider the cow Laundress=16206 is strong, and also those in which you consider her weak when viewed from the standpoint of a pure Shorthorn.

II. Give your opinion as to the value of the yearling steer Travertine for producing beef.

III. Compare the cows Sarah, No. 3,721, and Ontario Pet, (1), as Guernseys and (2), as dairy cows.

Practical Sheep.

I. Compare the merits of the two wethers "Donald," ear No. 1824, and "Duncan," ear No. 1849, as mutton sheep.

II. Give the strong and weak points as to physical conformation of the ram "Duke of Tuddenham 4th, 1864," viewed, (1), as a representative of the Dorset Horned breed, (2), as a mutton sheep.

III. Indicate the most objectionable points of physical form in the Leicester ram "Whitesmith," received as a representative of the breed.

Dairying.

I. Name five breeds of dairy cattle found in Ontario.

(*a*) Which do you prefer? Give reasons.

(*b*) How many of these breeds have an "advanced registry?" Do you consider this registry desirable; if so, why?

II. Give in the order of their importance the most essential requirements for successful dairying in Ontario.

III. What are the causes of impure milk? How may these be remedied? What practical bearing has the subject of pure milk on the dairy industry? How may the dairymen know whether the taint is caused by food or by ferment?

IV. Define fermentation. Distinguish lactic and rennet fermentation.

V. The ultimate sources of bacteria are what? How may they get into milk? Are they of any value to the cheese and butter-maker; if so, what?

VI. Name the "conditions favorable for cream raising."

VII. What are the points of merit in a cream separator? Is the separator likely to come into general use?

VIII. Describe the rennet test. Of what use is it to the cheese-maker?

IX. Name four marked improvements in the process of manufacturing Cheddar cheese in the Province.

X. The lactometer reads 30; the temperature is 64°F.; the per cent. of fat is 4.00. Find the per cent. of water, total solids, and solids not fat in the sample of milk.

Agricultural Chemistry.

I. Give your reasons why we should grow green crops rather than use the bare fallow.

II. To what extent should the average farmer use special manures; and what is the most appropriate manuring for barley, mangels, turnips, potatoes, clover, and meadow hay?

III. Give the chemical composition of fats, carbohydrates, and albuminoids; what are their particular functions in the body? and name some common Canadian fodders in which each predominates.

IV. Explain the following: Digestion co-efficient, nutritive ratio, feeding standard, ptyalin, peptones, amides.

V. What circumstances influence the proportion of food digested? And show why liberal feeding within certain limits is the most economical.

VI. Which of the common farm animals produces meat most economically and why? What per cent. of the fasted live weight of this animal when fat will be butcher's carcass?

VII. Which is the most wasteful, a ration too rich in albuminoids, or one having an excess of carbohydrates? Give reasons for your answer.

VIII. Given a fodder of the following composition: Water, 16.0; nitrogenous substances, 12.3; fat, 2.2; soluble carbohydrates, 38.2; fibre, 26; ash, 5.3; albuminoids, 10.2.

According to experiment the following proportion of the different nutriments of above fodder are digested: Nitrogenous substances, 55; fat, 52; soluble carbohydrates, 65; fibre, 45.

Determine albuminoid ratio of the fodder.

IX. Compare the relative manure value of bran, barley straw, linseed cake, peas, clover hay, mangels, oats; and how are the ash constituents distributed in the solid excrement and urine?

Entomology.

I. Give a list of the "borers" injurious to trees and shrubs, and describe a general remedy.

II. What are the characters of the sphingidae? Name some of the most injurious members of the family and the plants they attack.

III. Some insects are injurious in the larval condition; some as pupæ; some as the perfect insect, and some in all the stages of development. Give examples.

IV. Compare the following and give points of difference: Cut worm, cabbage worm, wire worm, and currant worm, and name the orders to which they belong.

V. Sketch figures showing the difference between an anthomyian fly and a saw-fly. What plants do they affect?

VI. Give notes upon the insecticides Paris green, pyrethrum, and carbolic emulsion, referring to their preparation and use.

VII. Outline the life history of the "bark louse" and give a remedy. Name some beneficial insects and the orders to which they belong.

VIII. Some minute beetles are very destructive to plants. Name them and the plants they affect, and show how they may be overcome.

IX. Give brief notes on the various methods that are followed in destroying insect enemies.

X. Identify the specimens before you.

Pathology.

I. Give causes, symptoms and treatment of acute laminitis.

II. Treatment for scratches.

III. Treatment for acute indigestion in the horse.

IV. Treatment for tympanitis in the ox.

V. Symptoms of azoturia.

VI. Treatment for regular strangles.

VII. Symptoms and treatment of simple ophthalmia.

VIII. Treatment for lymphangitis.

IX. Symptoms and treatment of choking in the ox.

Literature.—Shakespeare's King Lear.

I. Give your opinion of the character and conduct of King Lear himself in the play giving quotations and references.

II. Show that there are two tragedies in the play, and point out the poet's skill in blending and contrasting them.

III. Trace the characters of Kent and Edgar, showing the functions of each in his tragedy and in the play. Quote or refer to a passage uttered by each "out of his dialect."

IV. Tell the speaker and the position of each of the following, and explain the underlined parts:

(*a*) And well are worth the *want* that you have *wanted.*

(*b*) Wherefore should I
Stand in the *plague of custom;* and permit
The *curiosity* of nations to *deprive* me.

(*c*) All *cruels else subscribed.*

(*d*) *Subscribed* his power?
Confined to exhibition!

(*e*) *Renage,* affirm, and *turn their halcyon backs.*

(*f*) To bandy hasty words, to *scant my sizes.*

V. Quote what you can of the following passages:

(*a*) King Lear disowning Cordelia or banishing Kent.

(*b*) France choosing Cordelia.

(*c*) Lear when deprived of his train of followers.

(*d*) Lear and the fool on the heath in the storm.

VI. The gods are just, and of our pleasant vices
Make instruments to plague us.

(*a*) Tell the speaker and the place of this passage.

(*b*) Show to what extent this sentiment is the key-note of the play.

Political Economy.

(Two hours and a half allowed for this paper.)

I. What is Political Economy? Give a classification of the departments into which it is divided, and show the necessity of studying each in order that the whole may be understood.

II. What is Capital? Are any of the following capital: Virtue, Land, Labor, Education? Give your reasons.

III. Explain the terms "value in use" and "value in exchange," and show the relations between them.

IV. "The produce of work is divided into four shares which may be thus shown: Produce = wages + rent + interest + taxes." How do you determine how much should go to wages?

V. What is money? What are the chief circumstances which render the notes of Canadian banks a stable currency?

VI. What is a market? What are the causes which determine the areas of a market?

VII. If there were a specific duty of 30 cents a pound levied on all wool imported into Canada, in what state of the Canadian wool market would the Canadian consumer of wool be obliged to pay the duty, and in what state of market would the foreign producer of wool be obliged to pay the duty?

VIII. "The ordinary rent of a farm will usually include interest upon the capital spent on the farm buildings, roads, gates, fences, drains, and other improvements."

(*a*) State the laws which determine the amount which will be paid for what Jevons calls the "true rent" of a farm.

(*b*) State the laws which determine the rate of interest in any given community.

(*c*) Which of these two sets of laws determine the additional amount of money that will be paid by a tenant for the use of a farm with these improvements as compared with what will be paid for a farm equally good, except that it has not these improvements?

IX. Define taxes. What rules should be observed in laying on taxes?

Agriculture.

I. Mention the soils best adapted to the growth of the carrot; the more important particulars which relate to sowing it; the mode of harvesting to be adopted.

II. How would you manage when pasturing off a field of rape with sheep? Under which conditions would it be advisable to sow rape as a catch-crop?

III. Give some notes regarding the influence of climate on the growth of the sugar beet. How would you prepare the ground for growing a crop of the same? Mention some influences that increase the percentage of sugar in the beets.

IV. Describe how you would harvest timothy (phleum pratense) and the common red clover (trifolium pratense).

V. Give notes regarding the history and characteristics of scarlet clover (trifolium incarnatum).

VI. How would you prepare the land for growing a crop of corn? How far apart should the drills be, and also the plants in the line of the drills?

VII. Mention the leading characteristics of millet. Where may it be placed in the rotation? How much seed should be sown per acre?

VIII. Give the leading characteristics of meadow foxtail (alopecurus pratensis), of tall oat grass (avena elatior), of meadow fescue (festuca pratensis).

II. Papers Set at Midsummer Examinations, 1893.

FIRST YEAR.

Dairying.

I. Given a sample of milk, how would you proceed to determine its composition? What compounds would you likely find present, and what elements go to make up the different compounds? In what form are they found in milk?

II. Name the sources of the different parts of milk.

III. What is the most valuable and variable component of milk? Give the cause of its variation.

IV. Describe the method of testing milk with a Babcock tester.

V. Find the amounts of money each of the following patrons of a factory would receive, first by bulk plan, and. secondly, by quality plan, when

A sends 5000 lb., 2.50 per cent. milk.
B " 4500 lb., 3.00 " "
C " 2000 lb., 4.00 " "

The quantity of cheese made is 1100 lb.
Selling price, 10 cents per pound of cheese.
Cost of manufacturing, 1½ cents per pound.

VI. What method does the cheese-maker adopt to separate the water from the solid portion of milk?

VII. Give a list of the utensils that would be required in a dairy of ten cows to make butter on a farm?

VIII. What are the causes of "white specks" in butter? How may they be remedied?

IX. At what temperature would you churn sweet cream to obtain an exhaustive churning? What is the best temperature for churning ripened cream (1) in summer, (2) in winter?

X. What are the objections to

(1) The metamorphic theory of the secretion of milk?

(2) The transudation theory of the secretion of milk?

Botany.

I. Distinguish between annual and biennial roots, and name plants that have such.

II. Compare the order Rosaceæ with the Labiatæ, and name four plants in each.

III. Draw diagrams indicating the position of the stamens in relation to the pistil.

IV. Describe fully the process of fertilization, and name the agencies through which it is effected.

V. Distinguish between artificial and natural classification, and illustrate by referring to the following plants:

Cabbage, spiraen, turnip, hepatica, strawberry, buttercup, and mustard.

VI. What are the functions of the root and leaves?

VII. Explain the terms adhesion, silique, legume, key, ligulate, pome, anther, carpel, and give examples.

VIII. Give the characters of the orders Cruciferæ and Compositæ, and name three weeds found in each.

Geology.

I. Name the geological systems from which valuable economic products are obtained, and give a list of seven minerals that have contributed most of the valuable constituents in soil.

II. Illustrate the effect of air and rain upon rock masses in the formation of soil.

III. What systems are absent from Ontario, and how is this accounted for?

IV. Give the proofs advanced for believing that the interior of the earth is in a heated condition, and state how mountains are formed.

V. State at what periods in the earth's history great physical changes took place, and with what results.

VI. Describe the general appearance of things during the Devonian and Jurassic periods, referring both to life in the sea and upon the land.

VII. Give an account of the Silurian rocks of Ontario, their kind and distribution, and some of their chief fossils.

Materia Medica.

I. How do medicines act on the animal economy?

II. Define and give examples of (*a*) Disinfectant, (*b*) Antiseptic, (*c*) Tonic, (*d*) Astringent, (*e*) Purgative, (*f*) Dieuretic.

III. Name and give the doses of the principal purgatives for (*a*) the horse, (*b*) cow, (*c*) dog.

IV. What is aloes? Name the principal variety used in veterinary practice. Give its properties, actions, and uses.

V. Give actions and uses of Carbolic Acid.

VI. As a tonic, why is gentian preferable to cinchona?

VII. Give actions, uses and doses of Nitrate of Potash.

VIII. Give a prescription for a good blister (ointment).

IX. What are the indications for the use of nux vomica?

X. When is opium contra indicated?

English Grammar.

I. Analyze and parse the following sentence:
"Correct, where necessary, the following, giving the reason in each case."

II. Correct the following sentences, where necessary, giving reasons:
(1) Agreeable to his promise he came this p.m.
(2) Give every word and syllable their proper sound.
(3) We got into the barn and laid there all night.
(4) It is necessary to fully state the nature of the case.
(5) Hoping to hear from you soon, beiieve me yours truly.
(6) Toronto has a larger population than any city in Ontario.
(7) I am sure it wasn't me.
(8) This grammar contains a great quantity of exercises.

III. Give the principal parts of *shone*, *hung*, *wet* and *learn*.

IV. State fully the uses of *have*, *be* and *do*, as auxiliaries, and give an example of each.

V. Explain what is meant by *verbs of incomplete predication*, and give an example of each kind.

VI. Quote the rules for the different uses of the *period*, the *coma* and the *apostrophe*.

VII. Give the plural of *salmon, phenomenon, cloth* and *bean.*

VIII. "The Bishop of Niagara's charge."
Parse the words *Bishop, of* and *Niagara's.*

Literature.—Scott's "Lay of the Last Minstrel."

I. Mr. Wetherell (p. 38) says :—"A poem, especially a romantic poem, is a sustained hyperbole."
Explain this statement with reference to "The Lay."

II. Explain fully :
(*a*) Vengeance, deep-brooding o'er the slain,
Had locked the source of softer woe ;
(*b*) Merry elves their morris pacing,
To aërial minstrelsy,
(*c*) Moonless midnight or matin prime ;
(*d*) For he was barded from counter to tail.
(*e*) . . . . that wild harp, whose magic tone
Is wakened by the winds alone.

III. Point out three rhetorical figures in the above five extracts (in question II.).

IV. "With torch in hand, and feet unshod,
And noiseless step the path he trod ;
The arched cloister, far and wide,
Rang to the warrior's clanking stride."
(*a*) Divide these lines into metrical feet. (*b*) Mark the accented syllables.
(*c*) What is the prevailing kind of foot ?

V. Re-write in correct prose :
(*a*) "Red and bright the streamers light
Were dancing in the glowing north ;
So had he seen, in fair Castile,
The youth in glittering squadrons start ;
Sudden the flying jennet wheel
And hurl the unexpected dart."
(*b*) "For threescore years in penance spent,
My knees these flinty stones have worn."

VI. Tell the connection in which the following occur, and the meaning of underlined parts :
(*a*) Whose ponderous *grate* and massy bar
Had oft rolled back *the tide of war.*
(*b*) . . . . the streets of his *dunedin*
Saw lances gleam, and *falchions* redden.
(*c*) . . . . *the screened altar's pale ;*
(*d*) Nine and twenty *squires of name.*
(*e*) . . . . Earl Walter, *rest him, God !*

VII. (*a*) Why are the Spirits of the Flood and the Fell introduced ?
(*b*) Apart from the poem, tell very briefly what you know of *Michael Scott* and *St. Michael*

Arithmetic.

I. Find the cost, at $4.30 per cubic yard, of a stone foundation for a barn 42 feet by 28 feet (outside measurement), wall 9 feet high and 2 feet thick. (Take no account of doors or windows.)

II. (*a*) Find the simple interest on $280 at $4\frac{1}{2}$ per cent. for $3\frac{1}{2}$ years.
(*b*) The compound interest on $280 at 3 per cent. for 2 years.

III. Find the cost of painting (at 15 cents per square yard) the outside of a fence (5 feet 6 inches high) around a square field containing 120 square yards less than 3 acres.

IV. In multiplication of decimals, state the rule for placing the decimal point in the product.

V. An agent asks $120 for a binder. He gives me 15 and 8 off. How much less do I pay him than if he had given me a single discount of 20 per cent.?

VI. How much is 1 per cent. of 1 per cent. of 1 per cent. of $10,000?

VII. If 100 lb. barley be worth $1.50, how much are 72 bushels worth?

VIII. If $4 be discount off $424 for 2 months, what is the rate per cent.?

IX. Oats are worth 40 cents and wheat 76 cents per bushel. A man exchanges a load of wheat for the same weight of oats and $1.84 in cash. How many bushels of oats did he get?

SECOND YEAR.

Live Stock and Arboriculture.

I. Name and define the chief of the principles or laws which govern breeding.

II. What is the distinction between cross breeding and grading? What prominence should be given to each in the practice of the Canadian farmer?

III. Give the leading indications of nerve power in a dairy cow, the food rations suitable for a dairy cow in milk in winter.

IV. State (1) the effects of early castration on lambs, (2) the winter rations suitable for fattening lambs when coming one year old.

V. Contrast the wool and mutton-producing breeds of sheep (1) as to size, (2) as to form and (3) as to hardihood.

VI. Give notes regarding the gathering and preserving of forest seeds.

VII. How would you prepare a nursery seed bed suitable for growing forest seeds? How would you proceed in sowing the seeds?

VIII. Give notes regarding the planting of windbreaks.

Dairying.

I. Describe a short method of determining the per cent. of fat in (1) cream, (2) condensed milk and (3) cheese.

II. What are the essentials of a popular milk tester? Distinguish the lactoscope and lactometer. What practical use may be made of the latter?

III. A and B are shareholders in a cheese factory; C and D are non-shareholders.

A sends 3,500 lb. of 3 per per cent. milk.
B sends 4,000 lb. of 3.5C per cent. milk.
C sends 5,500 lb. of 4 per cent. milk.
D sends 6,000 lb. of 4.50 per cent. milk.

The quantity of cheese made is 1,900 lb.; selling price, 9 cents per lb. Cost of manufacturing to shareholders $1\frac{1}{4}$ cents, to non-shareholders $1\frac{1}{2}$ cents per lb. of cheese. Find the amount of money each should receive on "relative value" plan.

IV. On what principle does "paying according to fat" in cheese-making depend? Is it a just method? Give reasons for your answer.

V. Outline five methods of making a composite test. Which do you consider best giving reasons for your answer?

VI. Write short notes on condensed milk, oleomargarine, stearin, paluntin and olein.

VII. Give a brief outline of the method of manufacturing spring cheese. In what particular points does it differ from the method of making fall cheese?

VIII. Does food influence the percentage of fat in milk to any great extent? Cite any opinions or experiments bearing on the point. Does food affect the characteristics of the butter-fat? If so, in what way? Explain what is meant by the "Iodine equivalent" and the "Melting point" of butter. Are they of any practical value?

IX. Draw the ground floor plan of a centrifugal creamery (capacity 500 cows), giving size of rooms and locating the utensils and machines that would be required.

X. Select two samples of milk from those in the room, and determine whether they are adulterated or not. If adulterated, in what way?

Practical Chemistry.

I. Light the gas burner.

II. Determine the groups present in mixture No. 1.

III. In mixture No. 2, determine one base in each group present.

IV. Does mixture No. 3 contain phosphoric acid?

V. How may zinc be separated from manganese?

VI. What is the action of $BaCO_3$ upon chlorides of Cr, Al, Fe, Zn and Mn in solution?

VII. Marks may be added or deducted for the student's manner of working.

Botany.

I. Distinguish *stems* according to the nature of their growth, the mode in which they support themselves and the nature of their clasping organs.

II. (*a*) Describe the *functions* of *leaves*.
(*b*) What is the cause of their fall in autumn?

III. State clearly the *functions* of the *flower*, its *origin* and its *essential and accessory parts*.

IV. Refer each of the following plants to its proper order. Mention in each case the chief characters exhibited by the plant by means of which you are able to refer its order:
Chickweed, False Flax, Wild Columbine, Black Medick, Yarrow, Common Elder.

V. Distinguish clearly the Saxifragaceæ from the Rosaceæ. Give six examples from each order.

VI. What characters in a plant would lead you to consider it a *weed*? Name five orders, a large number of whose representatives are weeds. Give examples in each order.

VII. Name the different forms of smut, and give the life-history of two, together with remedies for the prevention of smut in wheat.

VIII. What is the chief distinction between Potato Blight and Plum Knot in regard to their spore formation?

Practical Horticulture.

I. Give notes on the Canadian wild flowers of April, May and June.

II. Give the method you would follow in the cultivation of shrubs, referring to their selection, planting and care.

III. Describe how the geranium, coleus, and currant may be propagated

IV. Arrange the following plants in the form of carpet and ribbon bedding: Alternanthera, Coleus, Alyssum, Stock Cerastium, Geranium and Nasturtium.

V. Give notes on the potting of plants, and draw a diagram illustrating cleft grafting. State what precautions should be observed in performing the operation.

VI. Give notes on the following shrubs: Syringa, Crataegus, Colutea, Spiraea and Caragana.

Veterinary Obstetrics and the Laws of Breeding.

I. Define (*a*) Parturition, (*b*) Immature birth, (*c*) Premature birth.

II. Give the symptoms and treatment of infectious or contagious abortion and the best measures to adopt in order to exterminate the disease from a herd.

III. In a case of normal parturition in a mare, what treatment should dam and offspring receive?

IV. In a case of breach presentation with the hind legs of the fœtus deviated downwards and forwards, how would you proceed to deliver?

V. Name and explain the arrangement of the fœtal membranes.

VI. Give symptoms and treatment of pervious urachus in a foal.

VII. Define (in breeding animals) (*a*) the law of heredity, (*b*) the law of atavism, (*c*) the influence of a previous impregnation; and state the lessons we are taught by these laws.

VIII. Define the term pedigree, and state its importance in breeding animals.

IX. Give your individual idea of the most profitable horse to breed for the present market, and state how to produce him.

Literature.—L'Allegro and Il Pensoroso.

I. What is the real theme of each of these poems? Explain the plan of the poems.

II. Describe the versification. How does the poet give it variety? Quote a passage of some ten lines and point out in detail its metrical peculiarities and merits.

III. Explain the meaning of the following words as employed in the poems:

rebeck, dight, pied, cynosure, decent, bout, yarish, philomel, civil-suited, embowed.

IV. Supposing the following passages express the real feeling of the writer, tell fully in simple language what he was actually wishing for:

(*a*) And may at last my weary age
Find out the peaceful hermitage,
The hairy gown and mossy cell,
Where I may sit and rightly spell
Of every star that heaven doth shew,
And every herb that sips the dew,
Till old experience do attain
To something like prophetic strain.

(*b*) And ever, against eating cares,
Lap me in soft Lydian airs,
Married to immortal verse.

(*c*) Where I may oft outwatch the bear,
With thrice great Hermes or unsphere
The spirit of Plato.

V. What is the character of the descriptions of nature in these poems? Quote specimens.

VI. Tell frankly what sort of pleasure, if any, these poems give you, and what feelings they awaken.

Hydrostatics and Road-making.

I. Show that the pressure at any point within a heavy inelastic fluid (not exposed to external pressure) is proportional to the depth of the point below the surface

II. What must be the weight of a body (12 cu. inches) which weighed in water, loses 1-9 of its weight?

III. Describe (with diagram):
(1) A hydraulic ram.
(2) A force pump with air-chamber.

IV. A receiver contains 24 cubic inches. Find density of air in it after
(*a*) two strokes of an air pump whose barrel contains 4 cubic inches.
(*b*) six strokes of a condenser whose barrel contains 2 cubic inches.

V. Find (in pounds) the pressure of water on the sides and bottom of a vessel 4 feet square (inside), the water being 3 feet deep.

VI. Four cubic inches of sea water (s. g. 1.025) are mixed with three cubic inches of a fluid (s. g. .910). Find s. g. of resulting fluid.

VII. How would you lay a "centre drain" in a road?

VIII. State general rules for:
(1) Slopes of roads.
(2) Materials to be used in repairs.

Steam Engine.

I. If you found a blister plate, what would you do?

II. If the safety valve were stuck, would you relieve the pressure on the boiler if the steam were up and could not escape?

III. If the water is suffered to get too low, what will be the consequence?

IV. What is steam?

V. What is a vacuum?

VI. Name all connections for a boiler outside of shell.

VII. How would you set an engine if it were not running true?

VIII. What is the relative proportion of a steam pump plunger to the size of steam cylinder?

IX. What causes a pump to work and feed a boiler against its own pressure?

X. Which will give the more power and better results, two 10-inch cylinders or one 20-inch cylinder, and why?

XI. Why is a boiler braced?

XII. What is a steam gauge for?

XIII. What is a safety valve for?

XIV. Give the different causes for boiler explosions.

Theoretical Mechanics.

I. Lay a steel square on the face of a board, having the 7″ mark of the blade on the edge and the 5″ mark on the tongue. The blade of the square will then be at an angle of 65°. With this sign as a given angle, construct a diagram that will obtain the several cuts for hopper or splayed work, and give the name of each angle respectively.

II. State in what order bench planes are used, and also the proper angles both for grinding and whetting.

III. Describe a well-trimmed saw. Give the shape of the teeth, both for ripping and also for cross-cutting.

Practical Mechanics.

Directions for making equal-sided hopper, similar to pattern. (Time allowed, 1½ hours.):

The given angle is 54°. Rip a piece of 1″ board 7⅛″ wide and three feet long. Dress both sides and shoot both edges to 7″. See that the bevels are right, then mark and cut the several angles required. Nail up with 2″ brads.

APPENDIX IV.

CLASS LISTS—EASTER EXAMINATIONS, 1893—FIRST YEAR.

Agriculture.

Class I.

1 Macfie, C. M.
1 Comfort, J. H.
3 Watson, J. H.
4 King, W. A.
5 Newman, W. M.
6 Buchanan, John.
7 Werry, M. J.
8 Atkinson, John.
8 Cook, J. H.
10 Brown, Robt.
10 Kidd, D. F.

Class II.

1 Brent, A. H.
1 Simpson, A. E.
3 Jardine, J. E. A.
3 Woolverton, T. N.
5 Christian, A. H.
5 Wheatley, Jno.
5 Reinke, C. E.
8 Kennedy, W. A.
8 Butler, E.
10 Robertson, G. A.
10 Vipond, J. M.
12 Gilleland, H. C.
13 Doherty, W. M.
14 Henderson, R.
14 McKenzie, R. V.
14 Thompson, W. J.
17 Pettit, F. E.
18 Shorey, S. C.
18 Fitzgerald, J. P.
20 McCullough, H. A.
20 High, A.
20 James, D. A.
23 Elliott, Wm.
23 Elmes, J. H.
23 Westover, M.
26 Wilson, E. E.
26 Travis, C. H.
26 Carrick, C.
26 Duffett, G. P.
30 Smyth, F. L.
30 Payne, G. Y.

Class III.

1 Rowe, G. F.
2 Mitchell, S.
2 Laird, J. G.
4 Clunn, W. P.
5 Wood, R. S.
6 Ross, T. E.
6 Caldecott, F.
8 Lailey, F. T.
9 McKay, W. E.
9 Graesser, F. A.
11 Millichamp, R. W.
12 McDonald, W. A.
13 McDonald, N.

Logie, A.
Fee, F. W.
Burdett, A. H.

Inorganic Chemistry.

Class I.

1 Macfie.
2 Robertson.
3 Atkinson.
3 Wheatley.
5 Watson.
6 Cook.
7 Comfort.
8 Rowe.
9 King.
10 Graesser.
11 Butler.
11 Jardine.
13 Wood.

Class II.

1 High.
2 Newman.
2 Kennedy.
4 Werry.
5 Christian.
5 Simpson.
5 Reinke.
8 Duffett.
9 Emigh.
10 Pettit.

Class III.

1 Laird.
2 Woolverton.
3 Doherty.
4 Lailey.
5 Kidd.
5 Gilleland.
7 Buchanan.
8 Ross.
9 Traviss.
10 Wilson.
10 Vipond.
12 Henderson.
12 Westover.
14 McCullough.
15 Shorey.
16 Elliott.
17 Thompson.
17 McKay.
17 James.

Brent.
Caldecott.
Payne.
Smyth.
Elmes.
Mitchell.
Carrick.
Fitzgerald.
McKenzie.
Logie.
Millichamp.
Burdett.
Clunn.
Fee.
McDonald, W. A.
McDonald, N.

Zoology.

Class I.

1 Macfie.
2 King.
3 Robertson.
4 Rowe.
5 Watson.
5 Comfort.
7 Atkinson.

Class II.

1 Kennedy.
2 Buchanan.
3 Wood.
4 Wheatley.
5 McKenzie.
6 Cook.
7 Ross.
8 Caldecott.
8 Henderson.
10 Butler.
11 Werry.
11 Pettit.
13 Laird.
14 Kidd.
14 Lailey.
16 Newman.

Class III.

1 Emigh.
1 Jardine.
3 Vipond.
4 Smyth.
5 High.
5 Simpson.
7 Woolverton.
7 Burdett.
9 Elliott.
10 McKay.
11 Brent.
11 Reinke.
13 Christian.
13 Elmes.
15 Graesser.
16 Duffett.
17 Doherty.
18 Gilleland.
18 James.
20 Traviss.
21 McCullough.
22 Westover.
23 Logie.
23 Mitchell.
25 Payne.
26 Wilson.
27 Millichamp.
27 Shorey.
29 Fitzgerald.
30 Carrick.
30 Thompson.
32 Fee.
33 McDonald, W. A.

Clunn.
McDonald, N.

Veterinary Anatomy.

Class I.

1 Watson.
2 Macfie.
3 Reinke.
4 Robertson.
4 Westover.
6 Buchanan.
6 Jardine.
8 Newman.
9 King.
10 Pettit.
10 Laird.
12 Butler.
12 Kennedy.
12 Atkinson.
15 High.
16 Werry.
17 McCullough.
17 Wood.
19 Wilson, E. E.
20 Christian.
20 Traviss.
20 Comfort.
23 Wheatley.

Class II.

1 Cook.
2 Gilleland.
3 Carrick.
4 Henderson.
5 Elmes.
5 Simpson.
7 Smyth.
8 Vipond.
8 Brent.
10 Ross.
10 Kidd.
10 Lailey.
10 McKenzie.

Class III.

1 James.
2 McKay.
2 Woolverton.
4 Doherty.
4 Rowe.
6 Duffett.
7 Payne.
8 Fitzgerald.
8 Elliott.
10 Thompson.
10 Millichamp.
12 Graesser.
13 Shorey.
14 Mitchell.
14 Hunter.
16 Burdett.

Caldecott.
McDonald, W. A.
Logie.
Clunn.
Fee.
McDonald, N.

CLASS LISTS—EASTER EXAMINATIONS, 1893 (*Continued*)—FIRST YEAR.

English Grammar.

Class I.

1 Macfie.
2 Comfort.
3 Watson.
4 Kennedy. / King.
6 Werry.

Class II.

1 Gilleland. / McCullough.
3 Newman.
4 Wheatley. / Wood.
6 Lailey.
7 Robertson.
8 Caldecott. / Jardine.
10 Rowe.
11 Cook.

Class III.

1 Traviss.
2 Reinke. / Brent.
4 Atkinson.
5 Wilson.
6 Payne. / Woolverton.
8 Kidd.
9 Buchanan. / Henderson.
11 James.
12 McKay.
13 Doherty. / Pettit.
15 High. / Hunter.
17 Graesser. / Carrick. / Logie.
20 Duffett.
21 Christian.
22 Millichamp.
23 Butler. / Fitzgerald.
25 Vipond.
26 Shorey.
27 Burdett.
28 Westover.
29 Elliott. / Laird. / Simpson. / Ross.

Fee.
Smyth. / McKenzie.
Elmes, J. H.
Thompson.
Mitchell.
McDonald, W. A.
Clunn.
McDonald, N.

Literature.

Class I.

1 Macfie.
2 Comfort.
3 Robertson.
4 Werry.
5 Wood.
6 Watson.

Class II.

1 Newman.
2 Atkinson.
3 King.
4 Simpson.
5 Lailey.
6 Wheatley.
7 Brent.
8 Rowe.
9 High.
10 McKenzie. / Millichamp.

Class III.

1 Kennedy.
2 Jardine.
3 Buchanan.
4 Kidd.
5 Graesser.
6 Butler. / Cook. / Doherty.
9 Caldecott. / Reinke. / Vipond.
12 Pettit.
13 Smyth.
14 Laird.
15 Christian.
16 McCullough. / Woolverton.
18 Elliott.
19 Gilleland. / Shorey.
21 Ross.
22 Payne.
23 Duffett. / James.
25 Henderson.
26 Carrick. / Westover.
28 Traviss.
29 McKay.
30 Thompson.
31 Elmes. / Fitzgerald. / Wilson.

McDonald, W. A.
Logie.
Mitchell.
Burdett.
Clunn.
Fee.
McDonald, N.

Arithmetic.

Class I.

1 Macfie. / Werry.
3 Comfort.
4 Robertson.
5 Reinke.
6 Wheatley.
7 Kennedy.
8 King.
9 Buchanan.
10 Wilson.
11 Brent.
12 Christian.

Class II.

1 High.
2 Fitzgerald. / Newman.
4 McCullough.
5 Ross.
6 Cook.
7 Woolverton.
8 Kidd.
9 Butler.
10 Gilleland.
11 Doherty. / James.
13 Jardine.
14 Atkinson.

Class III.

1 Smyth.
2 Rowe.
3 Henderson.
4 McKay.
5 Vipond.
6 Watson.
7 Traviss.
8 Duffett. / Pettit.
10 McKenzie. / Millichamp.
12 Westover.
13 Elliott.
14 Simpson.
15 Lailey.
16 Graesser.
17 Caldecott.
18 Logie.
19 Wood.
20 McDonald, W.A.
21 Payne.

Carrick.
Laird.
Shorey.
Elmes.
Thompson.
Fee.
McDonald, N.
Burdett.
Mitchell.
Clunn.

Mensuration.

Class I.

1 King. / Macfie.
3 McCullough.
4 Watson.
5 Woolverton.
6 Robertson.
7 Gilleland.
8 Comfort.
9 Reinke.
10 Wilson.
11 Wheatley.
12 Butler.
13 Atkinson.
14 Newman.
15 Christian. / Werry.
17 Kennedy.
18 Pettit.
19 Westover.
20 Cook. / Rowe.

Class II.

1 Traviss.
2 Ross.
3 Brent. / Caldecott. / Wood.
6 Graesser.
7 Fitzgerald.
8 Henderson. / James.
10 Buchanan.
11 High.
12 Kidd.
13 Vipond.
14 Lailey.

Class III.

1 Elliott.
2 Doherty.
3 McKenzie.
4 Jardine.
5 Carrick.
6 Logie.
7 Thompson.
8 Simpson.
9 Duffett.
10 McKay.
11 Smyth.
12 Laird.
13 Elmes. / Payne.
15 Millichamp.

Fee.
Shorey.
McDonald, W.A.
Mitchell.
Burdett.
Clunn.
McDonald, N.

Proficiency.

1 Macfie.
2 Comfort.
3 King.
4 Watson.
5 Robertson.
6 Werry.
7 Wheatley.
8 Kennedy.
9 Newman.
10 Atkinson.
11 Reinke.
12 Cook.
13 Buchanan.
14 Wood.
15 Butler.
16 Rowe.
17 Jardine.
18 High.
19 McCullough.
20 Gilleland.
21 Christian.
22 Pettit.
23 Woolverton.
24 Kidd.
25 Wilson.
26 Lailey.
27 Henderson.
28 Traviss.
29 Simpson.
30 Ross.
31 Vipond.
32 Doherty.
33 Westover.
34 Graesser.
35 James.
36 Duffett.
37 Elliott.
38 McKay.

CLASS LISTS—EASTER EXAMINATIONS, 1893—SECOND YEAR.*

Agriculture.

Class I.

1 Ferguson, J. J.
2 Atkinson, James.
3 Spencer, J. B.
4 McCallum, Wm.
5 McKenzie, W. G.
6 McNaughton, K.

Class II.

1 Kennedy, P. B.
2 McMordie, R.
3 Brown, W. J.
4 McCrimmon, W D
5 Cooper, W. W.
6 Husband, H. M.
7 Phin, A. E.
8 Conn, Joseph.
9 Stewart, J.
10 Dean, F.
11 Hay, L.

Class III.

1 Elmes, W. A.
2 Brooks, W. C.
3 Burns, J. H.
4 Hamilton, C. A. W
5 Lehmann, R. A.

Findlay, J. H.

Practical Cattle.

Class I.

1 Ferguson.
2 McKenzie.
3 Atkinson.
4 Stewart.
5 Spencer.
6 Phin.
7 Husband.
8 Hay.
9 McCallum.

Class II.

1 Conn.
2 Brown.
3 Hamilton.
4 Burns.
5 McNaughton.
6 McMordie.
7 Cooper.
8 McCrimmon.
9 Elmes.
10 Findlay.
11 Dean.
12 Kennedy.
13 Lehmann, Brooks.

Practical Sheep.

Class I.

1 Spencer.
2 Atkinson.
3 Stewart.
4 Phin.
5 Brown.
6 Conn.
7 Ferguson, McMordie.
9 McKenzie, Cooper.
11 McCrimmon.
12 McCallum.

Class II.

1 McNaughton.
2 Husband.
3 Findlay, Dean.
5 Elmes.
6 Hamilton.
7 Hay.
8 Kennedy.
9 Brooks.
10 Burns.

Class III.

1 Lehmann.

Dairying.

Class I.

1 Ferguson.
2 McCrimmon.
3 Atkinson.
4 Husband.

Class II.

1 Stewart.
2 McCallum.
3 Spencer.
4 Conn.
5 Brown.
6 Kennedy.
7 McMordie.
8 McKenzie.
9 Elmes.
10 Lehmann.
11 Dean.

Class III.

1 Brooks.
2 Phin.
3 Hamilton.
4 Cooper.
5 Hay.
6 McNaughton.
7 Findlay.
8 Burns.

Agricultural Chemistry.

Class I.

1 McKenzie.
2 McCallum.
3 Ferguson.
4 Spencer.

Class II.

1 Atkinson.
2 McMordie.
3 Kennedy, McCrimmon.

Class III.

1 Dean.
2 Husband.
3 Cooper.
4 Stewart.
5 Lehmann.
6 McNaughton.
7 Burns.
8 Phin.
9 Elmes.
10 Brooks.
11 Conn.
12 Brown.
13 Hamilton.
14 Hay.

Findlay.

Entomology

Class I.

1 Atkinson.
2 Ferguson.
3 Kennedy.
4 McKenzie.
5 McCallum.
6 Spencer.

Class II.

1 Brown.
2 McMordie, McCrimmon.
4 Lehmann.
5 Dean.
6 Brooks.
7 Husband.

Class III.

1 Stewart.
2 Phin.
3 Cooper.
4 McNaughton.
5 Conn.
6 Hay.
7 Elmes.
8 Hamilton.
9 Burns.

Findlay.

Diseases of Domestic Animals.

Class I.

1 McMordie.
2 Ferguson.
3 McKenzie, Kennedy.
5 Atkinson.
6 Spencer.
7 McCallum.
8 Conn.

Class II.

1 Dean.
2 Elmes.
3 Husband, Stewart.
5 Hamilton.
6 McCrimmon, Burns.
8 Hay.
9 McNaughton.
10 Cooper.
11 Phin.

Class III.

1 Brown.
2 Lehmann.
3 Brooks.
4 Findlay.

Practical Horse.

Class I.

1 McCrimmon.
2 Kennedy.
3 Hamilton.
4 Husband, Lehmann.
6 Hay, Ferguson, Cooper.

Class II.

1 Stewart, Spencer, McKenzie.
4 Phin, McCallum, Burns.
7 Elmes.
8 Atkinson, Brooks, Conn, McNaughton.

Class III.

1 McMordie.
2 Brown, Dean.
4 Findlay.

Literature.

Class I.

1 Husband.
2 Kennedy.
3 Ferguson.

Class II.

1 Atkinson.
2 McCallum.
3 McMordie.
4 Dean.
5 McKenzie.

Class III.

1 Spencer.
2 Conn.
3 Curzon, A. R., Stewart.
5 Elmes.
6 Burns, Brooks.
8 Phin, Hay.
10 Brown.
11 McNaughton.
12 Cooper, Hamilton.

Lehmann.
McCrimmon.
Findlay.

Political Economy.

Class I.

1 Kennedy.
2 Atkinson.
3 Ferguson, McKenzie.

Class II.

1 McCallum.
2 Brown.
3 Stewart.
4 Curzon, A. R., Husband.

Class III.

1 McMordie.
2 Spencer.
3 Cooper.
4 Brooks, McCrimmon.
6 Hamilton, Elmes.
8 Burns
9 McNaughton, Conn.
11 Phin.
12 Findlay.
13 Hay.
14 Dean, Lehmann.

* For general proficiency list see page 214.

CLASS LISTS—MIDSUMMER EXAMINATIONS, 1893 (*Continued*)—FIRST YEAR.

Agriculture.

Class I.

1 Macfie, C. M.
2 Comfort, J. H.
3 King, W. A. / Robertson, G. A.
5 Henderson, R.
6 Buchanan, Jno.
7 Werry, M. J.
8 Atkinson, Jno.
9 Kennedy, W. A.
10 Newman, W. M.
11 Butler, E.
12 Cook, J. H. / Wheatley, Jno.
14 Gilleland, H. C.

Class II

1 Christian, A. H.
2 Reinke, C. E.
3 High, A.
4 McCullough.
5 Shorey, S. C. / Laird, J. G.
7 Simpson, A. E. / Carrick, C.
9 Wilson, E. E.
10 James, D. A.
11 Thompson, W. J.
12 Fitzgerald, J. P. / Pettit, F. E.

Class III.

1 McKenzie, R. V.
2 Rowe, G. F.
3 Doherty, W. M.
4 DeHart, R. A.
5 Smyth, F. L. / Elliott, Wm.
7 Traviss, C. H.
8 Duffett, G. P.
9 Vipond, J. M.
10 Mitchell, S.
11 Logie, A. / Lailey, F. T. / McDonald, N.
14 Kidd, D. F. / Millichamp, R. W.
16 Millson, A. / Clunn, W. P. / Caldecott, F. / Graesser, F. A.

Wood, R. S.
McKay, W. E.
McDonald, W. A.
Aylen, C. S. F.
Fee, F. W.

Dairying.

Class I.

1 Macfie.
2 Comfort.
3 Kennedy.
4 King.
5 Butler.
6 Wheatley.
7 Cook.
8 Werry.
9 Robertson.
10 McCullough.
11 Reinke.

Class II.

1 Pettit.
2 Buchanan.
3 Christian. / James.
5 Elliott. / Atkinson.
7 Lailey.
8 Duffett.
9 Thompson.
10 Rowe. / McKenzie.
12 Doherty.
13 Wood.

Class III.

1 High.
2 Kidd.
3 Millson. / Laird.
5 Henderson.
6 Newman.
7 Fitzgerald.
8 Smyth.
9 Simpson.
10 Shorey.
11 Carrick.
12 Graesser.
13 Vipond.
14 DeHart.
15 Logie.
16 Millichamp.
17 Gilleland.
18 McDonald, N.
19 McDonald, W. A. / Mitchell. / Traviss. / Caldecott.

McKay.
Aylen.
Clunn.
Fee.

Materia Medica.

Class I.

1 Macfie.
2 Atkinson.
3 Cook.
4 Rowe.

Class II.

1 Robertson.
2 Butler.
3 King. / Doherty.
5 Comfort / Kennedy. / Wood.

Class III.

1 High. / Werry. / Duffett. / Simpson.
5 Buchanan.
6 Fitzgerald. / Millichamp. / Smyth.
9 Kidd.
10 Thompson. / Gilleland.
12 Vipond. / Graesser.
14 McKenzie. / Pettit. / Newman.
17 Reinke.
18 Laird. / DeHart. / Wilson.
21 Wheatley. / Christian.
23 Caldecott. / Henderson. / James. / Elliott.
27 Traviss. / Carrick.
29 Shorey. / McCullough.
31 McDonald, W. A.

Mitchell.
Emigh.
Aylen.
Lailey.
Logie.
McKay.
McDonald, N.
Clunn.
Fee.

Botany.

Class I.

1 Macfie.
2 King.
3 Kennedy.
4 Atkinson.
5 Comfort.
6 Robertson.
7 Buchanan.
8 Henderson.
9 Wheatley.

Class II.

1 Werry.
2 Traviss.
3 Cook.
4 Rowe.
5 McCullough.
6 Reinke. / Elliott.
8 Pettit.
9 High. / Wood.
11 Butler.
12 Laird.
13 James.

Class III.

1 McKenzie.
2 Wilson. / Shorey.
4 Gilleland. / Newman.
6 Emigh.
7 Christian.
8 Duffett.
9 Doherty.
10 Fitzgerald.
11 Carrick. / Smyth.
13 Simpson.
14 Mitchell.
15 Caldecott.
16 Vipond.
17 Lailey.
18 Thompson.
19 Millichamp.
20 McKay.
21 Kidd. / Logie.
23 Graesser.

DeHart.
McDonald, W. A.
Aylen.
McDonald, N.
Fee.
Millson.
Clunn.

CLASS LISTS—MIDSUMMER EXAMINATIONS, 1893 *(Continued)*—FIRST YEAR.

Geology.	Literature.	English Grammar.	Arithmetic.	General Proficiency.
Class I.	Class I.	Class I.	Class I.	1 Macfie.
1 Macfie.	1 Macfie.	1 Macfie.	Comfort.	2 Comfort.
2 King.	2 Rowe.	2 Comfort.	Doherty.	3 Robertson.
3 Atkinson.	3 Comfort.	3 Robertson.	1 Kennedy.	4 Kennedy.
4 Buchanan.	4 Werry.	4 Werry.	Macfie.	5 Werry.
5 Comfort.	5 Caldecott.		Werry.	6 Atkinson.
6 Robertson.	6 Wheatley.	Class II.	6 Newman.	7 King.
7 Kennedy.	7 Wood.	1 Atkinson.	Pettit.	8 Wheatley.
	8 Kennedy.	2 McCullough.	8 Wheatley.	9 Buchanan.
Class II.	9 Simpson.	3 Rowe.	9 Reinke.	10 Rowe.
1 Reinke.		4 Caldecott.	10 Robertson.	11 Cook.
2 Werry.	Class II.	King.	11 James.	12 Reinke.
Duffett.	1 Robertson.		12 Butler.	13 Butler.
4 Henderson.	2 Lailey.	Class III.	13 Atkinson.	14 McCullough.
James.	3 McKenzie.		14 High.	15 High.
6 McKenzie.	4 Doherty.	1 Duffett.	15 Wilson.	16 Doherty.
7 Cook.	5 McCullough.	Kennedy.		17 Henderson.
8 Smyth.	6 Millichamp.	Gilleland.	Class II.	Pettit.
Wheatley.	7 Buchanan.	4 Lailey.		19 Duffett.
10 Elliott.	8 Duffett.	5 Cook.	1 Buchanan.	20 Newman.
11 Laird.	9 Atkinson.	6 Wheatley.	Traviss.	21 McKenzie.
Rowe.	10 King.	7 Henderson.	3 Rowe.	22 James.
13 Simpson.	11 Cook.	8 High.	4 Henderson.	23 Simpson.
	High.	McKay.	McCullough.	24 Christian.
Class III.		10 Wood.	6 Duffett.	25 Gilleland.
	Class III.	11 Newman.	7 King.	26 Wilson.
1 High.		12 Pettit.	Wood.	Elliott.
2 Pettit.	1 Shorey.	13 Buchanan.	9 Christian.	28 Laird.
Wood.	2 Newman.	Graesser.	McKenzie.	29 Fitzgerald.
4 Carrick.	3 Gilleland.	Traviss.	11 Logie.	Caldecott.
Mitchell.	Reinke.	16 Fitzgerald.	12 Lailey.	31 Traviss.
6 Caldecott.	5 Christian.	James.	13 Kidd.	32 Shorey.
7 Gilleland.	6 Pettit.	Simpson.	14 Graesser.	33 Carrick.
Newman.	7 Elliott.	19 Shorey.	15 Fitzgerald.	34 Kidd.
9 Butler.	8 Traviss.	20 Doherty.		35 Thompson.
10 Wilson.	Kidd.	21 Butler.	Class III.	36 Graesser.
11 Doherty.	10 Graesser.	Kidd.		37 Vipond.
12 Lailey.	11 Henderson.	Reinke.	1 McKay.	38 Millichamp.
McCullough.	12 Vipond.	24 Christian.	2 Dehart.	
14 Christian.	13 DeHart.	Emigh.	3 Caldecott.	
15 Fitzgerald.	14 Butler.	Vipond.	4 Laird.	
16 Traviss.	James.	27 Laird.	5 Vipond.	
Millson.	15 Laird.	28 Wilson.	6 Gilleland.	
18 Vipond.	Wilson.	Carrick.	7 Cook.	
19 Kidd.	Aylen.	Millichamp.	8 Carrick.	
20 Millichamp.	18 Carrick.	29 Thompson.	9 Elliott.	
Shorey.	Logie.	Elliott.	10 Simpson.	
22 Graesser.	Fitzgerald.	McKenzie.	11 Shorey.	
23 Thompson.	21 McKay.		12 Smyth.	
DeHart.	Smyth.		13 Thompson.	
25 Logie.	Thompson.		14 McDonald, N.	
		DeHart.	Millichamp.	
McDonald, W.A.	McDonald, N.	Logie.		
Aylen.	Mitchell.	Smyth.	McDonald, W.A.	
McKay.	Clunn.	McDonald, N.	Aylen.	
McDonald, N.	McDonald, W.A.	McDonald, W.A.	Mitchell.	
Clunn.	Fee.	Mitchell.	Fee.	
Fee.		Aylen.	Clunn.	
		Clunn.		

CLASS LISTS—MIDSUMMER EXAMINATIONS, 1893 (*Continued*)—SECOND YEAR.

Agriculture and Arboriculture.

Class 1.

1 Ferguson, J. J.
2 Atkinson, Jas.
3 McCallum, Wm.
4 McKenzie, W.G.

Class II.

1 McMordie, R.
2 Husband, E. M.
2 McCrimmon, W. D.
4 Spencer, J. B.
5 Dean, F.
6 Conn, Joseph.
6 Elmes, W.A.
6 Kennedy, P. B.
9 Hay, L.
10 Brown, W. J.
11 Brooks, W. C.
12 Stewart, J.
13 McNaughton, K.

Class III.

1 Cooper, W. W.
2 Lehmann, R. A.
3 Burns, J. H.
4 Phin, A. E.
5 Hamilton, C.A.W.
6 Findlay, J. H.

Dairying.

Class I.

1 McCallum.
2 Atkinson.

Class II.

1 Ferguson.
2 McKenzie.
3 Dean.
4 Hay.

Class III.

1 Spencer.
2 McMordie.
3 Husband.
4 Brown.
5 Burns.
6 McNaughton.
7 McCrimmon.
8 Stewart.
9 Brooks.
10 Elmes.
10 Cooper.
12 Phin.
13 Kennedy.
14 Conn.
14 Hamilton.
14 Lehmann.

Findlay.

Analytical Chemistry.

Class I.

1 McCallum.
2 Atkinson.
3 Cooper.
4 Ferguson.
5 Phin.

Class II.

1 McKenzie.
1 Stewart.
1 Conn.
1 McCrimmon.
5 Elmes.
5 Hay.
7 Brown.
8 Brooks.
8 Burns.
8 McNaughton.
11 Husband.
11 Kennedy.
13 Hamilton.
13 McMordie.
15 Spencer.
15 Dean.

Findlay.
Lehmann.

Botany.

Class I.

1 McCallum.
2 Ferguson.
3 Atkinson.
3 Kennedy.

Class II.

1 McKenzie.
2 Husband.
3 Spencer.
4 Phin.

Class III.

1 Conn.
2 Cooper.
3 McMordie.
4 Stewart.
5 McCrimmon.
6 Brown.
7 Dean.
8 Hay.
9 McNaughton.
10 Lehmann.
11 Elmes.
12 Brooks.
13 Hamilton.
14 Burns.

Findlay.

Practical Horticulture.

Class I.

1 Kennedy.
2 Ferguson.
3 Atkinson.
4 McKenzie.
4 McCallum.

Class II.

1 Spencer.
2 Cooper.
3 McMordie.
4 McCrimmon.
5 Phin.

Class III.

1 Brown.
2 Lehmann.
3 Husband.
4 Conn
5 Burns.
6 Findlay.
7 Stewart.
7 Elmes.
9 Hamilton.
10 Dean.
11 Brooks.
12 Hay.
13 McNaughton.

Breeds of Horses and Obstetrics.

Class I.

1 McKenzie.
2 Spence.
3 Atkinson.
4 McMordie.
5 McCallum.
6 Ferguson.
7 Dean.

Class II

1 Lehmann.
1 McNaughton.
3 Kennedy.
4 McCrimmon.
5 Stewart.
6 Brooks.
7 Cooper.
8 Phin.
8 Elmes.
10 Hay.
10 Conn.

Class III.

1 Burns.
2 Husband.
3 Brown.
4 Hamilton.
5 Findlay.

Literature.

Class I.

1 Ferguson.
2 Husband.

Class II.

1 McCallum.
2 McMordie.
3 Atkinson.

Class III.

1 Spencer.
2 Kennedy.
3 Curzon, A. R.
4 Cooper.
5 Brown.
6 Dean.
7 Burns.
8 McCrimmon.
9 Stewart.
10 Elmes.
11 Conn.
11 Phin.
13 McKenzie.
13 McNaughton.
15 Hamilton.
15 Lehmann.

Brooks.

Hydrostatics and Road-making.

Class I.

1 Ferguson.
2 McCallum.
2 Phin.
4 McKenzie.

Class II.

1 Lehmann.
2 Atkinson.
3 Brooks.
4 Husband.

Class III.

1 McMordie.
2 Brown.
3 Cooper.
4 McCrimmon.
5 Kennedy.
6 Hamilton.
7 Spencer.
8 Elmes.
9 Stewart.
10 Dean.
10 Findlay.
12 McNaughton.
13 Conn.
14 Burns.
14 Hay.

General Proficiency.

Midsummer.	*Easter.*
1 McCallum.	1 Ferguson.
2 Atkinson.	2 Atkinson.
3 Ferguson.	3 McKenzie.
4 McKenzie.	4 McCallum.
5 McMordie.	5 Spencer.
6 Kennedy.	6 Kennedy.
7 Spencer.	7 McMordie.
8 Husband.	8 Husband.
9 Cooper.	9 Stewart.
10 McCrimmon.	10 Dean.
11 Phin.	11 Conn.
12 Dean.	12 Brown.
13 Brown.	13 Cooper.
14 Stewart.	14 McNaughton.
15 Conn.	15 Phin.
16 McNaughton.	16 Elmes.
17 Elmes.	17 Burns.
18 Burns.	18 Hay.
19 Hamilton.	19 Brooks.
	20 Hamilton.

APPENDIX V.

FINANCIAL STATEMENT FOR 1893.

I. College Expenditure.

(*a*) *College Maintenance.*

1. *Salaries and Wages*		$15,582 38
2. *Summer Course for Teachers*		500 00
3. *Food*—		
Meat, fish and fowl		3,339 66
Bread and biscuits, etc		608 92
Groceries, butter, and fruit		4,205 50
4. *Household Expenses*—		
Laundry, soap, and cleaning		379 70
Women servants' wages—cooks, laundresses, housemaids, etc		1,899 05
5. *Business Department*—		
Advertising, printing, postage, and stationery		1,166 94
6. *Miscellaneous*—		
Chemicals, apparatus, etc., used in laboratories		493 34
Library and reading-room—books, papers, and periodicals		371 82
Medals		66 20
Unenumerated		635 71
		$29,249 22

(*b*) *Maintenance and Repairs of Government Buildings.*

Furniture and furnishings	$ 845 78	
Repairs and alterations	1,065 89	
Fuel	3,723 28	
Light	829 84	
Water	650 00	
Sewage disposal	141 60	
		$7,256 39
		$36,505 61

College Revenue.

Tuition fees	$1,949 00	
Laboratory fees for gas and chemicals	79 00	
Fees for supplemental examinations	26 00	
Balances paid for board after deducting allowances for work in outside departments	5,141 66	
Contingencies—breakage, etc	55 85	
Bones and drippings	7 95	
Sundries	9 65	
		$7,269 11
Net expenditure		$29,236 50

The net sum voted by the Legislature for the College and the maintenance and repairs of Government buildings (see Estimates for 1893, pp. 35 and 39) was $31,632. Hence the unexpended balance for the year is $2,395.50.

II. Farm Expenditure.

(*a*) *Farm Proper.*

1. *Permanent Improvements*—	
Fencing, underdraining, material for sidewalks, grading and paving driveways, etc	$846 24

2. *Farm Maintenance*—

Salaries and wages	$4,372 98	
Live stock	1,055 70	
Maintenance of stock	1,880 71	
Seed	230 25	
Binding twine	51 88	
Repairs and alterations	516 80	
Furniture and furnishings, etc	412 85	
Tools and implements	184 35	
Advertising, printing, postage, and stationery	229 87	
Fuel, light, etc	95 49	
Contingencies	232 07	
		$9,262 95
		$10,109 19

Farm Revenue.

Sale of cattle	$1,520 15	
" sheep	920 48	
" swine	834 24	
" wheat	7 23	
" oats	356 15	
" peas	35 10	
" barley	85 00	
" rye	22 72	
" rape seed	3 70	
" milk	22 84	
" hides and pelts	9 05	
" wool	73 82	
Service of animals	155 00	
Keep of animals	129 80	
For road work	15 00	
		$4,190 28
Net expenditure of farm proper		$5,918 91

Unexpended balance for the year, $663.09.

(*b*) *Experiments.*

Salaries and wages—		
Experimentalist		$1,300 00
Foreman, teamster, and feeders		774 35
Laborers		2,269 02
		4,343 37
Seeds		372 95
Manure and special fertilizers		180 40
Stock for feeding		6 69
Furniture, furnishings, and repairs		227 43
Printing, postage, and stationery		107 69
Implements		192 25
Feed and fodder		10 30
Exhibitions		4 00
Contingencies		75 09
		$5,520 17

Unexpended balance for the year, $1,061.83.

III. Dairy.

(*a*) *Experimental Dairy.*

Salaries and wages—		
Dairyman	$600 00	
Laborers—milking, feeding stock, etc	601 03	
	1,201 03	
Purchase of stock—cows, pigs, etc	720 27	
Feed and fodder	512 22	
Furniture, furnishings, and repairs	538 83	
Advertising, printing, postage, and stationery	96 09	
Fuel	230 65	
Contingencies	125 86	
		$3,424 95

(b) Dairy School.		
Wages of Instructors	$362 11	
Purchase of milk	3,161 45	
Dairy appliances	1,481 74	
		5,005 30
(c) Travelling Dairy.		
Two dairies travelling for seven months		4,688 12
		$13,118 37
Dairy Revenue.		
Sales of butter	$1,080 31	
Milk	118 35	
Cheese	1,091 78	
Pigs	611 58	
Cattle	330 76	
Turnips	7 20	
Sundries	30	
Fees	285 00	
		3,525 28
Net expenditure of Dairy in all departments		$9,593 09

Unexpended balance for the year, $3,006.91.

V. Garden, Lawn, etc.

Salaries and wages—	
Lecturer on Horticulture	$562 25
Gardener	550 00
Assistant gardener	500 00
Second assistant	380 00
Teamster	333 96
Laborers	1,188 98
	$3,515 19
Manure	59 05
Trees, seeds, bulbs, etc	110 62
Furniture and furnishings, tools, flower pots, repairs, etc	400 38
Fuel, light, etc	860 80
Contingencies	35 58
	3,981 62
Less revenue—sales of produce	50 00
Net expenditure for the year	$3,931 62

Unexpended balance for the year, $1,284.38.

VI. Mechanical Department.

Salary of foreman	$700 00
Extra carpenter for erection of buildings, etc	600 00
Tools, etc	45 11
Fuel and light	28 88
Expenditure for year	$1,373 99

Uxexpended balance for the year, $2.01.

Total net expenditure for maintenance in all departments in 1893—	
College	$29,236 50
Farm proper	5,918 91
Experiments	5,520 17
Experimental and travelling dairies and dairy school	9,593 89
Garden, lawn, etc	3,931 62
Mechanical department	1,373 99
	$55,574 28

Total of unexpended balances on the year's operations in all departments, $8,413.72.

The amonnt paid by the College to students for labor in the outside departments was $3,788.80. This was done by crediting on board bills the sums allowed to students from week to week by the foreman under whom they worked.

Without giving a formal statement of account, I may say that the Farm furnished feed and bedding for the College horses, put in ice for College and Dairy, supplied the College with milk, potatoes, turnips, etc., and provided the hay, straw, pasture, and ensilage used by the Dairy Department.

The Garden also supplied the College with a large quantity of fruit and vegetables.

JAMES MILLS,
President.

APPENDIX VI.

MEETINGS OF FARMERS' INSTITUTES.

1894.

Division 1.

William Rennie, A. Elliott and D. Z. Fraser.

Durham	S. Grey	Jan. 2nd, 10.30 a.m.
Kenilworth	E. Wellington	" 3rd, 10.30 a.m.
Damascus	E. Wellington	" 4th, 10.30 a.m.
Hanover	S. Grey	" 5th, 10.30 a.m.
Tara	N. Bruce	" 6th, 10.30 a.m.
Port Elgin	N. Bruce	" 8th, 10.30 a.m.
Paisley	C. Bruce	" 9th, 10.30 a.m.
Edengrove	S. Bruce	" 10th, 10.30 a.m.
Mildmay	S. Bruce	" 11th, 10.30 a.m.
Clifford	W. Wellington	" 12th, 10.30 a.m.
Listowel	N. Perth	" 13th, 10.30 a.m.
Milverton	N. Perth	" 15th, 10.30 a.m.
Brussels	E. Huron	" 16th and 17th, 1 p.m on 16th.
Ripley	C. Bruce	" 18th, 10.30 a.m.
Kintail	W. Huron	" 19th and 20th, 1 p.m. on 19th.

Division 2.

C. A. Zavitz, B.S.A., L. Pattton and D. W. Beadle.

Parkhill	N. Middlesex	Jan. 2nd, 10 30 a.m.
Forest	E. Lambton	" 3rd and 4th, 10.30 a.m. on 3rd.
Brigden	W. Lambton	" 5th, 10.30 a.m.
Petrolea	W. Lambton	" 6th, 10.30 a.m.
Appin	W. Middlesex	" 8th and 9th, 10.30 a.m. on 8th.
Glanworth	E. Middlesex	" 10th and 11th, 1 p.m. on 10th.
Brucefield	S. Huron	" 12th, 10.30 a.m.
Exeter	S. Huron	" 13th, 10.30 a.m.
Coldstream	N. Middlesex	" 15th and 16th, 1 p.m. on 15th.
St. Marys	S. Perth	" 17th and 18th, 10.30 a.m. on 17th.
New Hamburg	S. Waterloo	" 19th and 20th, 10.30 a.m. on 19th.

Division 3.

Professor Shuttleworth, H. L. Hutt, B.S.A., and W. S. Fraser.

Ingersoll	S. Oxford	Jan. 2nd, 10.30 a.m.
Chatham	W. Kent	" 3rd, 10.30 a.m.
Dresden	E. Kent	" 4th, 10.30 a.m.
Comber	N. Essex	" 5th, 10.30 a.m.

Windsor	N. Essex	Jan. 6th, 10.30 a.m.
Leamington	S. Essex	" 8th and 9th, 10.30 a.m. on 8th.
Merlin	W. Kent	" 10th, 10.30 a.m.
Highgate	E. Kent	" 11th, 10.30 a.m.
Dutton	W. Elgin	" 12th, 10.30 a.m.
Shedden	W. Elgin	" 13th, 10.30 a.m.
Aylmer	E Elgin	" 15th and 16th, 10.30 a.m. on 15th.
Delhi	N. Norfolk	" 17th, 10.30 a.m.
Port Rowan	S. Norfolk	" 18th, 1 p.m.
Vittoria	S. Norfolk	" 19th, 10.30 a.m.
Waterford	N. Norfolk	" 20th, 10.30 a.m.

Division 4.

D. McCrae, Thomas Mason and A. H. Pettit.

Burford	S. Brant	Jan. 2nd and 3rd, 1 p.m. on 2nd.
Tilsonburg	S. Oxford	" 4th, 10.30 a.m.
Selkirk	Haldimand	" 5th and 6th, 1 p.m. on 5th.
Marshville	Monck	" 8th, 10 a.m. Evening meeting on 6th.
Stevensville	Welland	" 9th, 10 a.m.
Dunnville	Monck	" 10th, 1 p.m.
Port Robinson	Welland	" 12th, 10.30 a.m.
Grimsby	Lincoln	" 13th, 10.30 a.m.
Smithville	Lincoln	" 15th, 10.30 a.m.
Stony Creek	S. Wentworth	" 16th, 10.30 a.m.
Waterdown	N. Wentworth	" 17th, 10.30 a.m.
Ancaster	S. Wentworth	" 18th, 10.30 a.m.
St. George	N. Brant	" 19th and 20th, 1 p.m. on 19th.

Division 5.

Hon. Charles Drury, Simpson Rennie, *John J. Lenton and †L. G. Jarvis.

*Embro	N. Oxford	Jan. 2nd, 10.30 a.m.
*Drumbo	N. Oxford	" 3rd, 10.30 a.m.
*Freelton	N. Wentworth	" 4th, 10.30 a.m.
*Milton	Halton	" 5th, 10.30 a.m.
*Georgetown	Halton	" 6th, 10.30 a.m.
†Waterloo	N. Waterloo	" 8th and 9th, 1 p.m. on 8th.
†Guelph	S. Wellington	" 10th and 11th, 10.30 a.m. on 10th.
†Drayton	W. Wellington	" 12th, 10.30 a.m.
†Arthur	W. Wellington	" 13th, 10.30 a.m.
†Elora	C. Wellington	" 15th, 10.30 a.m.
†Belwood	C. Wellington	" 16th, 10.30 a.m.
†Orangeville	Dufferin	" 17th, 10.30 a.m.
†Shelburne	Dufferin	" 18th, 10.30 a.m.
†Malton	Peel	" 19th, 1 p.m.
†Brampton	Peel	" 20th, 10.30 a.m.

Division 6.

Professor Reed, T. G. Raynor, B.S.A., and W. H. McNish.

Flesherton	C. Grey	Jan. 2nd, 10.30 a.m.
Owen Sound	N. Grey	" 3rd, 10.30 a.m.
Meaford	N. Grey	" 4th, 10.30 a.m.

Thornbury	C. Grey	Jan. 5th, 10.30 a.m.
Stayner	W. Simcoe	" 6th, 10.30 a.m.
New Lowell	C. Simcoe	" 8th, 10.30 a.m.
Cookstown	S. Simcoe	" 9th, 10.30 a.m.
Alliston	W. Simcoe	" 10th, 10.30 a m.
Penetanguishene	C. Simcoe	" 11th and 12th, 1.30 p.m. on 11th.
Coldwater	E. Simcoe	" 13th, 10 a m. (Evening meeting on 12th.)
Orillia	E. Simcoe	" 15th, 10.30 a.m.
Churchill	S. Simcoe	" 16th, 10 30 a.m.
Newmarket	N. York	" 17th and 18th, 1 p m. on 17th.
Woodbridge	W. York	" 19th, 10 30 a.m.
Weston	W. York	" 20th, 10.30 a.m.

DIVISION 7.

Professor Panton, Joseph Yuill and John Jackson.

Little York	E. York	Jan. 2nd and 3rd, 10.30 a.m. on 2nd.
Uxbridge	N. Ontario	" 4th, 10.30 a.m.
Beaverton	N. Ontario	" 5th, 10.30 a.m.
Little Britain	W. Victoria	" 6th, 10.30 a.m.
Lindsay	W. Victoria	" 8th, 10 30 a.m.
Bobcaygeon	E. Victoria	" 9th, 10 30 a.m.
Fenelon Falls	E. Victoria	" 10th, 10.30 a.m.
Peterborough	W. Peterborough	" 11th, 10 30 a.m.
Warkworth	E. Northumberland.	" 12th and 13th, 1 p.m. on 12th.
Keene	E. Peterborough	" 15th, 10.30 a m.
Lakefield	W. Peterborough	" 16th, 10.30 a.m.
Norwood	E. Peterborough	" 17th, 10.30 a.m.
Claremont	S. Ontario	" 18th, 10.30 a.m.
Whitby	S. Ontario	" 19th, 10.30 a.m.

DIVISION 8.

Richard Gibson, H. L. Beckett, B.S.A., and Henry Arkell.

Newburg	Addington	Jan. 2nd, 10.30 a.m.
Stella	Lennox	" 3rd, 10.30 a.m.
Napanee	Lennox	" 4th, 10.30 a.m.
Shannonville	E. Hastings	" 5th, 10 30 a.m.
Bloomfield	Prince Edward	" 6th, 10 30 a.m.
Demorestville	Prince Edward	" 8th, 10.30 a.m.
Fenella	W. Northumberl'd	" 10th, 10.30 a.m.
Baltimore	W. Northumberl'd	" 11th, 10.30 a.m.
Orono	W. Durham	" 12th, 10.30 a.m.
Bowmanville	W. Durham	" 13th, 10 30 a.m. (No evening meeting.)

DIVISION 9.

John McMillan, M.P., Captain G. Farewell and I. W. Steinhoff.

South Finch	Stormont	Jan. 2nd and 3rd, 10.30 a.m. on 2nd.
Mountain Station	Dundas	" 4th, 10.30 a.m.
Merrickville	N. Grenville	" 5th and 6th, 10.30 a.m. on 5th.
Spencerville	S. Grenville	" 8th, 10.30 a.m.

Iroquois	Dundas	Jan. 9th, 10.30 a.m.
Cornwall Centre	Cornwall	" 10th and 11th, 1.30 p.m on 10th.
Lyn	Brockville	" 12th, 10.30 a.m.
Mallorytown	Brockville	" 13th, 10.30 a.m.
Lansdowne	S. Leeds	" 15th, 10.30 a.m.
Delta	S. Leeds	" 16th, 10.30 a.m.
Kingston	Frontenac	" 17th and 18th, 1 p.m. on 17th.
Centreville	Addington	" 19th, 10.30 a.m.

DIVISION 10.

John I. Hobson, G. E. Day, B.S.A., and R. F. Holtermann.

Tweed	E. Hastings	Jan. 2nd, 10.30 a.m.
Lanark Village	N. Lanark	" 3rd, 10.30 a m.
McDonald's Corners	N. Lanark	" 4th, 10.30 a.m.
Perth	S. Lanark	" 5th, 10 30 a.m.
Smith's Falls	S. Lanark	" 6th, 10.30 a.m.
Cobden	N. Renfrew	" 8th, 10.30 a.m.
Pembroke	N. Renfrew	" 9th, 10 30 a.m.
Renfrew	S. Renfrew	" 10th and 11th, 1 p.m. on 10th.
Manotick	Carleton	" 12th and 13th, 10.30 a.m. on 12th.
Alexandria	Glengarry	" 15th, 10.30 a.m.
St. Raphael	Glengarry	" 16th, 10 30 a.m.
Vankleek Hill	Prescott	" 17th and 18th, 1 p.m. on 17th.
Rockland	Russell	" 19th and 20th, 10.30 a.m. on 19th.

DIVISION 11.

D. McCrae, I. W. Steinhoff and Jonathan Sissons.

Bracebridge	Muskoka	Feb. 12th.
Port Carling	Muskoka	" 13th.
Utterson	Muskoka	" 14th.
Emsdale	E. Parry Sound	" 15th.
Edgington	W. Parry Sound	" 16th.
Parry Sound	W. Parry Sound	" 17th.
McKellar, Dunchurch	W. Parry Sound	" 19th.
Magnetawan	E. Parry Sound	" 20th.
Sundridge	E. Parry Sound	" 21st.
Powassan	E. Parry Sound	" 22nd.
Thessalon	E. Algoma	" 24th.
Bar River	C. Algoma	" 26th.
Richard's Landing	St. Joseph's Island	" 27th, 28th.
Marksville	St. Joseph's Island	March 1st.
Bruce Mines, McLennan	E. Algoma	" 2nd.
Iron Bridge	E. Algoma	" 3rd.
Gore Bay, Manitowaning	Manitoulin Island	" 5th, 6th.
Little Current	Manitoulin Island	" 7th, 8th.

APPENDIX VII.

FIFTEENTH ANNUAL REPORT.

OF THE

ONTARIO AGRICULTURAL AND EXPERIMENTAL UNION.

The fifteenth annual meeting of the Ontario Agricultural and Experimental Union was held at the Agricultural College, Guelph, on December 21st and 22nd, 1893, commencing at at 10 a.m., on the 21st.

The President, A. G. McKenzie, Fairview, Ont., occupied the chair.

REPORT OF COMMITTEES.

Mr. C. A. Zavitz : The committee composed of Mr. E. Lick and myself, who were appointed to wait upon the Minister of Agriculture for the purpose of securing an increased grant for the Association, beg to report the appointment fulfilled. We interviewed the Hon. Mr. Dryden early in January and, after presenting the claims of the Association, asked that the "Union" grant be increased from $400 to $700 per year. We were very kindly received by Mr. Dryden, who spoke very favorably of the work being done by the Association and also increased the grant to $650.

The report was accepted.

PRESIDENT'S ADDRESS.

The President, Mr. A. G. McKenzie, then delivered the following address :

Gentlemen :—In the first place, I desire to thank you, the members of the Experimental Union, for electing me to this office, which I think is a very important one. The Union is now looked upon throughout the country as an important organization ; and as the President's office is the highest office in the gift of that organization, I consider myself highly honored.

We have endeavored to carry on some experimental work throughout the year that we thought would be profitable to ourselves and beneficial to others. The Union was organized about fifteen years ago—this is the fifteenth annual meeting. The idea first originated among the students and officers of this institution. The experimental work at first was not very extensive,—there being only about a dozen experiments, I think, carried on the first year. This continued to grow throughout the years, and rather slowly for seven or eight years, but during the last four or five years it has made rapid strides, and we have been getting considerable grants from the Government. This year we have $650, last year and the year before about $400. During the last year our Secretary of the Agricultural committee has sent out about 1,400 different sets of experiments to about 1,200 experimenters ; and has also sent out over 7,000 packages. You understand that this means considerable labor ; and so much distributed throughout this Province should be of great interest to us.

Our Union has been difficult to manage in more ways than one. We have had no organization to look back upon and from which to get hints. We claim that we are the largest co-operative society in America ; and consequently we think ourselves of no mean

importance. One great principle with us is to feel our way as we go along cautiously—do not undertake work that we would be likely to fail in. You will notice that the most important branch of our work has been most successfully developed, that is, agricultural work, pure and simple. The other committees have been feeling their way as it were. The Committee on Entomology, for instance, was formed only last year, and the report of this year will be the first report; and their work is no doubt important. Then we have the Committee on Horticulture. They do not spend nearly so much money as the Committee on Agriculture, but yet their work is important and they are improving in method year by year. I refer to these, but will not enlarge, as we shall have reports from each of them. Then we have a Committee on Bee-keeping, to use a common term, and that committee has difficulties to overtake, and they are feeling their way.

Now, the difficulties of the work are very considerable. I may speak in the first place about the difficulties in connection with agricultural experiments, and I think probably that is the easiest part of the work. We on the farm know that if we are to make any success of farming in Ontario we must be very close at home—it is not to be got for nothing. Very often the hired man makes a tool of the employer, and the employer in many cases cannot trust to leave the hired man in charge of the work, should he go away to post himself well in scientific agriculture. It is hard for us even to come here for a couple of days. Again, we have to contend against difficulties more than that directly in connection with the work. We know, too, the work needs a lot of attention in seeding and harvest time, and that is the time the Agricultural Union puts work upon us. We have to take care that these plots are laid out properly, that the seed is sown properly, and that it is harvested, threshed, accounts kept, etc. That means no little amount of work if it is done properly, and taken out of the harvest time it is considerable.

Does it pay us to take up this Union work? Directly speaking, we cannot say that it will—we cannot make money out of the plots that we sow; but indirectly I think it it is profitable to us to carry on the work. In the first place, we have taken a course at this College, and have spent considerable time in gaining education here. How are we going to keep up this education? In the universities they talk about the university extension movement. I think we have the best plan of extension that can be followed—the co-operative experiment system. And then each re-union year after year tends to freshen and invigorate us in our farm work. We come back to meet our old associates, to meet the best scientists of the day and other important men, to get a new stimulus for the year that is coming; and in order to be good members of the Union we must keep ourselves more or less educated or we cannot expect to take an active part in our meeting. Every member should be willing to take his part of the work; and as President I would like to impress this upon you, do not leave all the work for the officers. Your place is important, and let every member realize this.

Then, what is our aim in connection with the Agricultural Union? Our aim is, I think, principally scientific work. A great many of our neighbors have not had the privilege of knowing what our Union has done, and it is those people who are down on reforms. Hence we find difficulty. Last spring when I would be going to the office for seed, etc., they would say, "Are you going to sow the whole of your farm with garden seeds?" They would look aghast when I explained. Visitors would be passing my fields, and seeing the road between the lots would wonder what insane fellow was doing this. A man who works hard in College will work hard when he leaves. Those who fail to take up work after getting an education, are the men who spend the time idling while at College. Of course there is something antagonistic between the two. As the dairymen say, there is an antagonistic principle between beef and dairying—that you cannot get the very best milk cow to be the very best beef cow. So possibly the very best student in science will not be the very best worker on the farm.

Our Union should be of a scientific nature. We should all be very careful and correct with our experimental work, so that as time goes on we may leave a record in our reports which may be looked up to by scientists.

There are perhaps one or two suggestions that I might make directly; and, first, some of our members find it difficult to take up the practical and actual work of experimenting. Now, the idea struck me that if some arrangement could be made among all the committees to have the regulations sent out from the one address, as it were. As it is, the Agricultural Committee will print their forms and send them out, the Committee on Entomology will print their forms and send them out; and this, I think, causes more expense than is really necessary. If by some method all these forms could be got out together, so that the experimenters could get them all in time, and they can choose what work they can take up. Again, let information be asked from all the members in a general way. You see, those of us who are in different localities are successful perhaps in some lines, and we have trouble in some certain lines. Now, we are anxious that we get deliverance from these troubles; and if we had a place in connection with the Union to make known these difficulties where we find the science of agriculture hard to work with the practice, and *vice versa*? Thus the Secretary could so collect these means of of information that he might be able to give something useful. As the work goes on we will see our way more clearly, and I hope that every student of the College will become a member of the Union—that everything will be done to promote it in those ways that are healthy. It has come to that point now when we are not so much anxious to have members increased as to have quality in the Union.

REPORT ON HORTICULTURAL EXPERIMENTS.

The following report was presented by ELMER LICK, Oshawa, Ont.: The Horticultural Committee, after consultation, decided to continue experiments with varieties of potatoes, also introducing experiments with varieties of strawberries and raspberries. Unexpected difficulty was met in securing the varieties of potatoes desired, which fact delayed the sending out of seed early in the season. One gratifying feature was the fact that Mr. Anson Groh desired us to test a new variety of his own growing.

A circular was sent to those desiring to experiment with potatoes, and to experimenters of last year who had reported results. Owing to the lateness of the planting season, with dry weather following, the variations in yield are not as great as was the case in previous years. We have only seven full reports which can be tabulated and averaged. However, these are apparently reliable, and will speak for themselves.

SHOWING AVERAGE WEIGHT OF EACH VARIETY AND ESTIMATED YIELD PER ACRE.

Experimenters.	Rural No. 2.		Empire State.		Summit.		Burpee's Extra Early.		Kaiser.		Puritan.		Distance apart of rows.	Soil.	Date of planting.
	Total weight.	Small.	Total weight.	Small.	Total weight.	Small.	Total weight.	Small.	Total weight.	Small.	Total weight.	Small.			
	lb	lb	lb	lb	lb	lb	lb	lb	lb	lb	lb	lb			
Anson Groh.....	25	2	29	4	31	4	37½	7½	34	2	29½	5	27in.	Sandy loam.	June 2.
Wm. Cartwright.	85	2	85	3	80	2	60	3	68	3	82	2	24in.	Clay	May 22.
Orlando White ..	38	2½	43	3	43	6½	40	15	35	2½	51	9	42in.	Sand	May 16.
Hugh Collins....	58	2½	62	2½	36	2¾	61	4	.....	...	43	5¼	24in.	Clay	May 30.
J. W. McBain...	101	3	95	4	88	5	85	5	90	4	80	6	30in.	Clay loam ..	May 18.
Jas. Burns	62	...	49	...	67	...	57	...	65	...	54	...	36in.	.....	July 4.
J. M. Hartman .	82	0	61	6	51	13	57	14	63	0	59	9	30in.	Clay loam ..	May 29.
Average yield (1 row 6 rods long)	64.4	1.7	60.6	3.2	56.6	4.7	56.7	7.0	59.1	1.9	56.9	5.2	...	.....	.....
Yield per acre...	188.9	bu.	177.7	bu.	165.9	bu.	166.2	bu.	173.3	bu.	165.9	bu.	...	.....	.....

The following table shows the yield per 99 feet of row of the other varieties grown by the experimenters as a result of request to grow best yielder of their own varieties.

Experimenter.	Varieties.	Total weight.	Small.
		lb	lb
Nelson Monteith	Empire State	120	42
	Summit	144	36
	Toronto Queen	135	39
	Rural No. 2	123	30
	Harbinger	72	48
	Kaiser	126	33
	White Elephant	138	39
	Burpee E. Early	132	42
F. B. Hutt	Kaiser	147½	32½
	Rural No. 2	160	25
	Empire State	185	32½
	Beauty Hebron	167½	35
	Puritan	140	15
Geo. G. Shirreff	Burpee's E. Early	150	0
	Toronto Queen	100	12½
	Kaiser	125	20
Benjamin Shirreff	Kaiser	140	7½
	Empire State	140	5
	Bell	130	5
	Summit	125	10
W. H. Foster	Harbinger	76	15
	Summit	51	10
	Rural No. 2	71	9
	Burpee's Extra Early	61	11
	Toronto Queen	57	17
Thomas Steadman	Crown Jewel	78	5
	Burpee's Extra Early	77	6
	Thoroughborne	81	7
	Summit	70	5
	Harbinger	54	10
	Rural No. 2	68	2
	Bella	67	4
	Hebron	74	7
	Elephant	78	4
Jas. Watson	Kaiser	90	10
	Harbinger	36½	18
	Empire State	102	6
	Rural No. 2	81	3¾
	Burpee's Extra Early	63¾	6
	Summit	80½	8
D. K. Erb	Toronto Queen	84	11½
	Kaiser	63	3
	Everett's Seedling	81	7½
	Kaiser	67½	2½
	Summit	67½	15
	Burpee's Extra Early	112½	7½
Robt. Wills	Harbinger	50	7½
	Rural No. 2	100	2½
	Empire State	90	12
	Toronto Queen	77½	7½
	Summit	48	5
	Puritan	55	8
J. W. McBain	Rural No. 2	74	2
	Empire State	68	3
	Grange	59	6
Orland White	Daisy	75	7
	Van Oram's Early	58	13
	Burpee's Extra Early	57½	12
	White Elephant	46	9
Angus Grol	Crown Jewel	35	6
	Elephant	32	4
	Kummer's Seedling	30½	2

TABLE SHOWING THE REPORTED MEALINESS AND QUALITY.

—		Rural No. 2.	Empire State.	Summit.	Burpee's E. Early.	Kaiser.	Puritan.
Mealiness	Good	5	7	5	7	3	7
	Medium	2	.....	2	.....	4	.....
	Bad	.....	.....	.....	.....	.....	.....
Quality	Good	5	6	4	6	4	5
	Medium	2	1	3	1	3	2
	Bad	.....	.....	.....	.....	.....	.....

REMARKS OF EXPERIMENTERS.

ANSON GROH, Preston, Waterloo Co.: The season here was so severely dry that the order and date of ripening could not be fixed with any precision, as they simply dried up at the same time

JAMES BURNS, Greenbank, Ontario Co.: Those potatoes which were sent to me on the 3rd of May did not reach me until the 4th of July. They are barely ripe.

J. W. HARTMAN, Elmhedge, Grey Co.: The potatoes were planted on clay loam sod, which had received a dressing of manure before they were planted. The season was very dry. Rural No. 2 and Kaiser grew very large. Their tops were green when dug October 10th.

GEORGE G. SHIRREFF, Clarence, Russell Co.: I find Burpee's an excellent potato, a fine yielder, and ripens so early that the blight does not seem to affect it. Puritan, although not as good as Burpee's, keeps its rank ahead of the varieties sent out in 189-, except in cooking properties. Kaiser is a very good yielder of mealy tubers, but small comparatively.

BENJAMIN SHIRREFF, Allenford, Bruce Co.: These are four good varieties of potatoes for a general crop. They have all done remarkably well considering the very dry season we have had. I prefer the Summit for use; it is, indeed, a very fine table potato. The Kaiser is not quite up to the others in mealiness.

W. H. FOSTER, Leamington, Essex Co.: The Empire State was a failure from the black heart in the spring. I would recommend the Harbinger for late, the Summit for medium late, and Burpee's Extra Early for family use.

THOS. STEADMAN, Wyoming, Lambton Co.: I am well satisfied with Crown Jewel, Burpee's Extra Early and Thoroughborne. They are good potatoes, smooth and saleable. The season in this section of the country was not good for potatoes—too dry—but I had a very good crop.

JAS. WATSON, Sonya, Durham Co.: On account of the dry summer none of the varieties were up to last year in yield. All the varieties were good except Harbinger. Crop was entirely free from blight.

Conclusions.

1. Rural No. 2 heads the list in yield. This year has been a very favorable one for this variety; no blight to injure the tops before ripening. The estimated yield is 188.9 bushels per acre.
2. Empire State occupies second place in yield.
3. Kaiser, a new variety, gives great promise, and is one deserving further trial under a more favorable season.
4. The Puritan, Burpee's Early, and Summit are all practically grouped as to yield.

Mr. HILBORN: I have not made very many experiments with potatoes, but there was one thing that impressed me while listening to my friend, and that was that some of the variations we noticed between the two years might possibly be caused by sowing seed that in one case was better than it was in the other. I am a strong advocate of selecting seed. I made one experiment that quite convinced me of the point just spoken of. When I first went to the Central Experimental Farm I purchased a load of Early Rose potatoes, and from this load I selected about a bushel of the most perfect ones that I could find—not the large ones, but good, even-sized potatoes. I had them cut and planted the same day as the rest of the load, and in the hurry of the work and the great amount that was to be done, I had forgotten about the experiment until we came to dig them. I told the men who were digging them that they were all of the same variety, but they informed me that their must be two varieties, because there was such a difference in the potatoes. I went to the patch and clearly saw the difference, and remembered that the better potatoes were from the selected seed. I believe that it

would pay any grower of potatoes to have a small plantation just for growing seed Mark the best ones in the plot, and take the best potatoes from these marked hills, and if we continued doing that, I do not think there would be any danger of our varieties running out.

E. LICK: How would you select potatoes for seed—what standard?

Mr. HILBORN: I would select medium-sized ones and the most perfect of their type.

G. F. MARSH: Would you go over the field while they were growing?

Mr. HILBORN: Yes; and in growing early potatoes I would select the earliest ones and the ones with the strongest stalks.

E. LICK: Do you think that changing from one soil to another is advantageous?

Mr. HILBORN: Yes, it helps to a great extent, but I think the selection has more to do with it than the change of seed.

Dr. MILLS: Would you go farther north or farther south in selecting seed?

Mr. HILBORN: I would rather, I think, go farther north, although within our own province I do not think it matters a great deal. We imported 240 varieties from Germany and tested them at the Experimental Farm, but we found that the imported varieties did not succeed as well as our American choice.

Prof. SHUTTLEWORTH: Did you decide after one year's experiment?

Mr. HILTON: We had only tested them for two years when I left, and the conclusion then was that the imported varieties did not succeed so well as the American choice.

S. HUNTER: Does it hurt potatoes for seed to have them frozen?

Mr. HILBORN: I have known potatoes to remain out all winter and still grow. I think that depends somewhat upon whether the tubers have been thoroughly ripened in the fall.

Hon. JOHN DRYDEN: I would like to emphasize what Mr. Hilborn has just said. I think he has given us sound doctrine when he speaks about the proper selection of seed; and, further, the doctrine is just as sound, that the seed ought to be properly cared for during the winter. I have a little experiment on my own farm in this way: I give the married men the privilege of growing their potatoes—they furnish the seed, and I give the ground and do all the cultivation. My seed is kept out in the pit during the winter, and it comes out as fresh in the spring as it was in the fall. The men, however, plant their small potatoes kept in the cellar, and for my own seed I make some selection, not very minute. I have seen as a consequence of this, year after year, a wonderful difference. With exactly the same treatment you will find a great difference. This principle holds good in almost everything: in the different kinds of grain, I believe, you would find the same results. Our varieties of wheat and potatoes run out, and I believe it is largely due to our own making.

J. S. PEARCE: There cannot be too much stress laid upon the point mentioned. In the experimental work that you carry on here, there should be a great deal of attention paid to the selection of seed, and not only for one year, but year after year. I forgot to ask Mr. Lick whether the seed used this year was from the experiments of last year. (Mr. Lick replied that it was fresh seed.) A part of your results is therefore lost. I have been watching this matter for a great many years, and I am fully satisfied that if a large class of our young men and farmers would make a selection of the old standard varieties and follow it up for three or four years, they would surprise themselves and surprise the country.

Dr. MILLS: I heard a reliable farmer at Port Perry say that he sowed a small part of a field with tailings, and got a better crop from that part of the field than from that which was sown with cleaned seed.

Hon. Mr. DRYDEN: There is evidently something wrong about that. There is no doubt what that man called tailings were not tailings at all If the sieve is a little small the best of the wheat goes over. Certainly we cannot believe that to sow what is considered as tailings would give good grain.

WM. RENNIE: I will give you my experience in growing potatoes for exhibition purposes. We have settled the question thoroughly with regard to flat culture. We could not grow them half the size when drilled up. We selected typical potatoes of the variety sown and put one in each hill whole. We have tried all methods—small ones, large ones, cut, etc.,—but the best results were from one large potato put in each hill and fertilized with different things—ashes, bone dust, salt, etc., beyond the addition of manure. We thoroughly sub-soiled the ground before planting, and after the potatoes had started to grow, we spaded the ground quite deep with the spade fork.

H. L. HUTT: I fully agree with what has been said regarding the selection of seed. I tried the experiment of preparing seed before planting. Potatoes that are brought from the cellar and have not sprouted are considered the best for planting. I took some potatoes out of the cellar about a month before planting time, so that they had short green sprouts upon them. Along by the side of these I planted some of the same variety, same size, sowed the same day, all conditions similar, only that they were brought direct from the cellar. Of those which were brought up a month early and which had sprouts on them every hill grew, while those which were brought direct from the cellar did not grow nearly so well. I got some very marked results in bringing the seed up and having it ready at once.

Dr. MILLS: Do you advise flat culture for the ordinary growth of potatoes on the farm?

Mr. RENNIE: Certainly. It is advisable to ridge them a little with a cultivator, but not enough to run the rain off.

T. H. MASON: Drilling is practically unknown in Elgin; we practice flat cultivation altogether. We plant about 4 inches deep on the sandy soil; shallower on the heavier parts.

Prof. T. F. HUNT, Columbus, Ohio: I have been very much interested in this discussion *re* shallow or deep cultivation for any crop after it has been planted, and I would like to suggest one or two fundamental facts with regard to it. Why do we cultivate ground after the crop is planted? We do it for two reasons—to kill the weeds and to stir the soil. In stirring the soil it is not necessary to kill the weeds, although the two things generally go together. Why do weeds do any harm? In the first place, they take plant food out of the soil. It has been estimated that a ton of pigweed would take out about as much phosphoric acid, about twice as much nitrogen, and five times as much potash as a crop of wheat. If you put on one hundred times as much fertility as the wheat needs, you will easily see that the weeds do something else than take out the fertility. In the second place, they shade the ground, and we know such crops as potatoes and corn want clear sunshine and plenty of heat. On the Ohio State farm, with two varieties, they raised 50 bushels more per acre where they put on straw manure than where they put better manure on and worked it into the ground. In the farm department we raised three-quarters of an acre of corn which was mulched with manure and produced more corn in that way than in any other. So that shading the ground cannot be the only harm. We know that weeds take much water; and it has been determined by experiment that for each pound of dry matter produced in wheat, corn, potatoes, oats, etc., there are 300 pounds evaporated through the plant. Now, if that is true, when we raise an acre of timothy we have transferred into the atmosphere 600 tons of water, and when we raise 4 tons of corn for fodder we have transferred into the atmosphere 1,200 tons of water; and this is the true reason why we kill weeds—to control this supply of water. One year I grew about 25 varieties of corn and got about 30 bushels of dry shelled corn per acre. I took the precaution to send to the same growers the same year and to get the same seed, and I put the same variety on the same plot, and the second year treated, as near as human ingenuity could treat it, the same way as the previous year and got 90 bushels of dry shelled corn per acre. Why? During the first year we had 12 inches of rain, during the second 21, and that 9 inches of rain had given the 60 bushels of corn.

Now, why do we cultivate soil at all? In the first place we cultivate it to make it loose, so that the roots can go in among it. In the second place, we cultivate to increase

its fertility. You know that if you take Glauber's salt and put it in water it takes some time for it to dissolve; you also know that if you take this salt and put it into a mortar first it dissolves at once. That is just why you cultivate soil, in my estimation. It is to make the ground even. Only that which is soluble in the soil is plant food. In all these crops, such as potatoes, and I can speak specially for corn, if you cultivate the ground deep, you destroy the roots, and you do far more injury to the roots than any possible richness you can add from cultivation. You cannot expect to accomplish any special good in stirring the soil to increase its fertility after the corn and potatoes are planted; that must be done previously. During three years hand running I raised 77 bushels of shelled corn per acre on land that was never cultivated from the time it was planted until the corn was harvested. Now, we had three other plots that we cultivated the ordinary depth of 4 inches, and on these plots we got 74 bushels, a difference of 3 bushels in favor of that not cultivated. I have experimented in this line since and have found out substantially the same thing every time. I can raise more corn this way than if I stirred the ground deep, because I break off the roots in deep cultivation. I have determined that we break off about two-thirds of the roots if we cultivate deep; and that by cutting off the roots around the plant we actually decrease the yield from 10, 15, to 20 per cent.

We always have found, however, that some surface cultivation is better than no cultivation, but that no cultivation is better than deep cultivation. Now, why? We find that if we put a lot of cut straw on the ground we decrease the evaporation from the soil. We tried shallow, deep, and every other kind of cultivation, but the plots that were mulched did the best, because the evaporation was stopped. Now, then, if we stir the soil loosely we may also stop the evaporation. We may make a mulch out of the soil instead of using straw. There comes a hard rain in July and August and you need that for your corn and potatoes, and the ground is hard and level; does it not run off? would not almost all of it run off? Now, to my mind, that is the reason why we stir soil. In one experiment we plowed two plots twelve or thirteen times, and two others four or five times each, but we did not get a bit more corn from the former than from the latter. All you want to do, in my estimation, to raise corn or potatoes is to give it that cultivation which will keep it free of weeds, and to cultivate as little as possible and not any deeper than is necessary to kill these weeds.

REPORT OF APICULTURAL COMMITTEE.

The following report was presented by Mr. R. F. HOLTERMANN: Last year, you will remember, we had work in connection with foul brood, and that work was to have been carried on during the present year. You are also aware that Mr. McKenzie very kindly gave us his time and experience free of charges, and promised to do what he could during the present year. I may say that I saw Mr. McKenzie, once in Toronto, and was in the city at two other times and tried to see him, but it appears that he has been so busy this year on other work that the work in connection with foul brood has not been carried on, but is at a standstill. Mr. McKenzie still has some wax belonging to the Union. During the past year or more, a new invention has attracted the attention of bee-keepers throughout the world. The invention was a contrivance to be used for hiving swarms. The method of working was as follows:

The self-hiving appliance was placed under the brood chamber, and used instead of a bottom board, the lower brood chamber and supers were raised and a new hive with combs placed underneath with a true bottom board under this new hive. The bees before swarming passed in and out through the self-hiver and partly through the new hive. By means of perforated metal and other constructions, the mother bees could pass back and forth at will, but the queen could only pass from the old hive into the new and then could neither return to the old or leave the new.

The result would be that when the swarm issued they would pass in their accustomed way through the self-hiver, through the new hive and out. The queen would attempt to

follow and pass from the old hive and be trapped in the new. The bees when upon the wing would find the queen absent and return to the old entrance on their way, through the new, to the old hive and in passing through the new hive they would find the queen and remain there. The old brood chamber could then, when convenient, be placed on a new stand and become a distinct colony. The watching for and hiving of swarms, has been up to the present a great drawback to the farmer; many swarms have been lost and with that the season's profits have often disappeared Under these circumstances your Committee considered an experiment with these self-hivers particularly appropriate.

The self-hivers were supplied to G. A. Deadman, N. Monteith, E. M. Husband, M. B. Smith, J. N. Whally, Myers Bros., J. Clark, E. Shaver, Goold, Shopley & Muir Co., (Limited), R. F. Holtermann, D. McCormack, Wm. Bayless, in numbers varying from one to three. There were also thirteen others whose names we secured, but who purchased the self-hivers on their own account.

The great rush of work, owing to the peculiar nature of the season, prevented some from making a careful test, but eleven self-hivers were used.

In every case the swarm issued as expected and the queen was trapped in the new hive. In all but two cases the bees before swarming went down to the new hive and stored honey in the empty combs put there for the new swarms. If combs were removed the bees build comb of their own and stored honey therein. By some the means of communication was reduced in hope that this would prevent the bees going down but without avail. This would be no disadvantage in running for extracted honey, but it would be a decided disadvantage for comb.

Again, in a large apiary, the bees on the wing without a queen would sometimes unite with other swarms which would issue at the same time. Again they would cluster and remain out for a considerable time before returning to their hive, increasing the danger of uniting with other swarms. For any one having only a few swarms the danger from this source is not great and this difficulty is no great disadvantage even should two swarms unite.

Another careful test will be made next season. Up to date, the results go to show, for extracted honey, the self-hiver will be a great advantage to the farmer keeping a few colonies. For comb honey the results are unfavorable.

Signed, R. F. Holtermann.
S. N. Monteith.
E. M. Husband.

REPORT ON DAIRYING.

The following oral report on Dairying was submitted by Prof. Dean:

I have been very busy during this last year; in fact, I have had more work than I could attend to. The other members of the Committee have not done anything. At the time of the last meeting of the Union, Mr. S. P. Brown, who was proposed to take up the work in regard to practical farm dairying experiments, promised to outline a set of experiments and send them to me, and I was to send them out to the farmers, but for some reason, however, he did not do so. Mr. Palmer was working in a cheese factory and promised to work up some experiments, but I did not receive any word from Mr. Palmer at all. Therefore no experiments have been undertaken.

In regard to myself, I did try to get two lines of work undertaken. During this past summer, Mr. Rogers, my assistant, and myself have been carrying on a series of experiments to find out whether it would be possible to keep composite samples of

milk over a week. This past season has been an interesting one among factorymen from the fact that a number of our factories are paying by test—that is, according to the per cent. of fat in the milk. That means that the samples had to be taken every day and the milk tested once a week. That has been the common practice; and I thought it would be possible to make these samples continue for a month. At the present time, factorymen test four times during the month. The secretary has to multiply the average per cent. of fat by the number of pounds sent to the factory every week, making up his totals of fat in this way; but if he can keep these samples for a month, that means that he will have to test the samples but once a month, which means to multiply the per cent. of fat by the total number of pounds for the month. As far as our experiments go, the details of which you will find in the College report, I am fully convinced that it possible to keep them for a month—in fact, we kept them for seven weeks and found them to give very close results compared with samples tested every day. I asked two factories to undertake this work, but only one replied; and they I understand tried it for two weeks and found it to work very well.

Another line of work that I have been working on myself and which I have tried to get others to undertake, but so far have not been able to, is the effect of food on the per cent. of fat in milk. We had that discussed here last year. Some say if you feed the cows rich food the milk will be rich. Of course that looks reasonable, and I have had a great deal of correspondence along this line. One man said he thought he would not believe that food had any effect on milk; but until a man can show me that he has done actual experimental work in this line I cannot put any confidence in his statements—his opinion is worth no more than mine. We had a very strong letter from a man who supplies milk in the city of Toronto. He said "when we slop cows with a meal got from brewers the customers find fault with the milk." I asked him to undertake an experiment—You take samples and send them to us and we will pay express charges and test them if you will do the work." I never heard any more from him. Our own experiments have gone to show that the cows give just as good milk when given slop as when fed on other foods.

So far as our experiments have gone they indicate that the food has very little if any effect on the per cent. of fat in the milk. I did not mention that it is a common impression that when cows are turned out in the spring the milk gets poorer. In some places in the United States they consider that the milk is poorer in May and June, and therefore they allow a lower standard. We found in every case instead of the milk getting poorer it was richer if anything. We had samples from the cows when they were on the regular meal ration; and when they were turned out to pasture there was an increase in the per cent. of fat; but there are so many other things that come in on this point that it is a very difficult matter to settle.

BEE-KEEPING IN ONTARIO AND HOW TO SUCCEED.

Following is a paper by R. F. Holtermann, Brantford: When we speak of bee-keeping and the production of honey in Ontario, we speak of a branch of agriculture which can live and thrive irrespective of protective duties.

The province, whenever the opportunity offered, has carried off the highest laurels for the quality of its product. At the Philadelphia Centennial, Wm. McEvoy, an Ontario bee-keeper, carried of the sweepstakes prize. At the Indian and Colonial Exposition, Ontario's honey exhibit attracted the attention of the world. At the World's Fair, Chicago, Ontario has distinguished herself, not only in the number of her awards on honey, but by the high score taken by exhibitors, the United States Bee Journals admitting that our Ontario honey is unsurpassed. The quality is the best, and we can also secure honey in Ontario in paying quantities

As in all other agricultural products, the standard of perfection which is reached depends upon that which is under the control of man and that which we have given

us among the many blessings of a Divine Providence. That Providence, gentlemen, has richly endowed this province, yea, this Dominion, no one within its borders will wish to deny, and no one without its borders dare dispute, after the magnificent record she has left upon the pages of the world's history through the recent Exposition. Ontario, owing to the undulating character of its physical surface, the variety in the nature of its soil, flora and climate, can produce honey of the very best quality and in quantities sufficiently large to make it possible to engage in this branch of agriculture with success, and these varieties of conditions over a large area will give Ontario a crop with reasonable certainty every year—an item of great value in exporting. All then, that lies *without* the power of man is given to us more lavishly than any other land I know of. What about that portion which does lie within our power—how has it been developed?

We, that is the Ontario Bee-keepers' Association, receive an annual grant of $500 from the Ontario Government, and this is used mostly for paying the travelling expenses and hotel bills of the officers. The balance, after paying the other expenses in connection with the Association, is spent in paying the expenses in connection with county associations and their lecturers and bee literature. Then we have from the Ontario Government the services of a foul brood inspector, whose duty it is to keep down a disease known as foul brood, and this is to be done according to an Act passed by the Ontario Government. We have also an Act to prevent the spraying of fruit trees while in blossom. This Act is as great a benefit to fruit-growers as to bee-keepers.

The Ontario Government has also paid a portion of the expenses in connection with the Indian and Colonial Exposition and the late exhibition at Chicago. The Dominion Government has rendered some assistance at the Colonial and Chicago Exhibitions. That I believe is all. From no source have we received further assistance to enable us to produce a better article and in larger quantities.

The many questions which arise in this new industry, and under such varying conditions, have had to be solved thus far by individual effort. The solution must largely be left to those specially employed for this purpose, and this is particularly the case because the bee-keepers' harvest comes with a rush, and at that time of the year he is unable, owing to pressure of time, to make a careful test of results under different methods of management. What success has been achieved has been gained through individual efforts. The press of our country, and public men generally, have considered the subject as too trifling to be worthy of attention, when it has a right, which is more manifest every day, to rank among the very first in importance in the broad field of agriculture. Our press will occasionally cull some extracts upon bee keeping from a United States writer, when our own are in no sense unworthy of such honor. This inattention has had advantages in that it has endowed us with greater strength and determination to overcome difficulties, but it has hindered the spreading of useful information and has greatly lessened the consumption of honey within our province. Great Britain annually imports about ten million pounds of honey; lack of assurance has delayed the development of a foreign market, when we find assurance has been given in this direction to so many other branches of agriculture.

This state of affairs has meant a loss to bee-keepers, and therefore a loss to the province of a large sum of money per annum. Aside from this, there has been a loss to the province of hundreds of thousands of dollars. Owing to the peculiar position of the bee-keeping industry, it has been made the instrument for the extortion of money from the innocent and the credulous. It is forever human nature to want to get something for nothing, and those who have looked for the gains of a moment, irrespective of the means adopted, have taken advantage of this; they have also taken advantage of the large profits which have been made under proper management, and with these instruments of destruction they have gone forth to their deadly work. In every part of the province men and women bought bees, under the supposition that all that was necessary was to buy the appliances, and without *knowledge*, *care*, or *labor*, the ten-dollar bills would roll up in proportion to the number of colonies kept. The result was, in 95 cases out of 100, the loss of the money invested and the hindering of the development

of bee-keeping. In this, as in every case, the honorable, the honest, and the just course is the one which is the best for all. To-day we are producing sufficient honey for our home market, and we are beginning to feel that we need more of a consuming public, be that at home or abroad. The price by many is considered low, but in bee-keeping, as in everything else, there are men making money at the business and men losing money at it.

I was struck by the statements of two men, farmers and bee-keepers in different parts of the province, who said they would sooner produce a pound of honey than a pound of pork. This was when pork was worth about $4.65 per hundred. Having defined the position of bee-keeping and viewing it, I trust, carefully and dispassionately, I find bee-keeping may, under proper conditions, be engaged in with success in Ontario. The cost of production can also be greatly reduced by better methods, some known, others as yet uncertain. Bee-keeping is, in some respects, like every other branch of agriculture, and, in other respects, unlike. Like every other branch of agriculture, the less the chance of a failure of crop owing to surrounding circumstances the better.

To succeed in it to the utmost, we must concentrate our energies and abilities upon our work. We must learn to know ourselves, let that knowledge emanate from pleasant channels or otherwise. Too many have the idea that labor should be avoided and only engaged in as being a necessary evil. Happy is the man who can enter into his labors looking through them for more than an earthly reward, and happy is he who throws his energies into life's employment, in which the making of mere dollars and cents is a side issue. Under such a stimulus the wear and tear of nerve and body is reduced to a minimum.

There is too much of an idea abroad that with supper, or at least twilight, labor should cease. Especially is this true during long winter evenings. The idea also prevails too much that recreation means to spend our time without profit. A swarm of bees weighing 5 lb. will perhaps gain nothing in weight per day; one weighing 6 lb. will gain 5 lb. per day; one weighing 7 lb. gain 10 lb. So it is with ourselves. In average time, with average ability, we will be able to gain nothing on the men who work under the same conditions; it is just to the extent to which we exceed the average that we will excel.

Next, to succeed in bee-keeping, theory and practical experience must go largely hand-in-hand. You may read with profit before beginning, but theory cannot long go without the hand of practice. Be open to learn from others, but be careful to distinguish between fine-spun dreamy theories and sound information.

Go to conventions, they are very valuable. Do not exercise false economy in the direction of literature upon the subject you are interested in. In purchasing bees and appliances, get the best for your purpose; this may not be those at least cost; on the other hand, they may not be the most expensive.

Bee-keeping is unlike every other branch of agriculture, in that it is perhaps the least developed; we have few, if any, what we might call official experiments to look to. It displaces no other department and no other crop on the farm, unless to the extent that the farmer too often gives equal attention to too many branches and excels in none.

Then it becomes a question as to which one it will pay him best to drop. Bees, aside from the honey they gather, will pay to act as fertilizing agents in the orchard and clover field. We have in Ontario an artificial condition in plant life. The honey-bee is not a native of Ontario. Aside from the female, (the queen,) large numbers of worker bees are wintered who are ready for work as soon as the first warm winds blow. This gives us an artificial condition in insect life. The honey crop takes nothing from the fertility of the soil. Owing to the price of honey per lb., it does not take much hauling to take $100 worth to market—this in a new country and over rough roads is quite an item. One can, if they possess the information, engage in bee-keeping with success in many newly settled districts when not an acre of land is cleared. This is an important item for a struggling settler.

In closing let me say, let us use fully the information we possess and look for more What has been said would appear to lead anyone in the direction of aiming at merely worldly success. Such is not the intention. The higher and nobler aims should run through and above all else. The man who makes the greatest success of life may be the one who is never heard of outside of his own community.

The noblest lives are those to duty wed,
Whose deeds, both great and small,
Are close-knit strands on an unbroken thread
Where love ennobles all.
The world may sound no triumphs, ring no bells;
The Book of Life the shining record tells.

A. PICKET: The paper that we have listened to has impressed us with the fact that the writer has had something besides theory in his mind It would also impress us with the fact that he knows by actual labor what it means to be a successful bee-keeper. It seems to me that he knows full well that it requires diligent care, a great amount of labor, and a constant watch to make a success of bee-keeping. Like all other pursuits, there is one way and one road to success, and there are many ways to failure. The road to success, simply means, in the first place, that a man must have the interests of the work at heart, or in other words that he is an enthusiast; it means a man must have some pluck to face any difficulty and not retreat under any circumstances. From my own personal experience, I know that a young man who is careful and who will give the care and attention that is necessary to success in any other pursuit in life may make a success of bee culture; but that is wherein it lies—in the small things, which we are so apt to overlook We may work never so hard, spend so many hours in the apiary, and we may do our level best in many ways to secure a crop, and be disappointed in the end from the fact that we have overlooked some very trivial thing We must keep bees of the best strain, but that is not the most important part. In my experience I have found that the most important part is to have the right man in the right place. The bees will gather the honey, provided they are attended to, cared for and protected as they should be. With the necessary care which can be bestowed upon it and which can be gained by the literature of the day and by the experience which may be gained, and is so easily obtained now to what it was years ago, a person may make a success of the business and gain a livelihood; but that the road to success is easy I cannot say.

Dr. MILLS: What has the undulating country to do with the honey?

Mr. PICKET: In my experience I have found that on the higher lands we get the lightest colored honey. Some of us have had the opportunity of seeing honey that has been produced in some of the lower lying lands in different places; and we found that the lower the land the darker and the stronger the honey. At the Fair in Chicago, I think that is one of the items that has won so largely, the color of our honey.

R. F. HOLTERMANN: Unless the land is too low, a variety of elevation has this effect: on the higher lands the blossoms will come out earlier and on the sandy soil also, and on the clay and lower land we have it coming out later; and in that way we extend our honey flow and are able to secure larger yields from the same flower. Sometimes a colony will gain 15 pounds in a day. You can imagine then what the gain would be in weight by the bloom coming out on the lower land four or five days later. Close to the lake they come out later than farther inland. If you get about four miles away from the lake your fruit blossoms are earlier than near the lake.

Dr. MILLS: It would not affect the quality?

Mr. HOLTERMANN: I always consider that our flora has much to do with the advantageous circumstances in Ontario. We are likely to get better honey from the same flower than they get in the Northern States.

Dr. MILLS: What plants produce the best honey?

Mr. HOLTERMANN: The Canadian thistle, clover, basswood, etc.

Mr. PICKET: Have you ever known a better class of honey than we have had this season?

Mr. HOLTERMANN : No, it is very fine this year, and it is mostly from clover.

E. M. HUSBAND : After what you have heard, I think you will all agree with me that bee-keeping requires push, pluck, and perseverance. I have had two years' experience in bee-keeping and also some ups and downs. I was going to believe all that I read in the papers. I found, however, that these statements may be true in certain cases, but did not hold true in average years. In bee-keeping, like other occupations, you cannot count upon a large thing every year. One of my first mistakes in it was in choosing a wrong hive—too large a hive, and one that is not now in common use. If a person has a large hive, perhaps in another year he concludes that it would be better to produce some comb honey ; and having a large hive that is not suitable for comb honey, and finding that he has made a mistake, he will have to go to the expense of changing. There are questions which none of our writers can give decisive answers upon. Hence the necessity for the experiments that we are carrying on. Swarming is one of the most difficult troubles we have to face, and it is so especially with the farmer. He is called away to other work, the bees swarm, the women folks are busy and the swarm is lost. It would be a great gain to have a self-hiver, and Mr. Holtermann has shown that a certain device will answer this to some extent, if not altogether.

Dr. MILLS : It would appear from what has been said that the prizes for honey were awarded because of the natural condition of the country rather than on the skill of the operators.

R. F. HOLTERMANN : If you admit the same in dairying, we shall admit it in reference to honey. There is a great deal in running for extracted honey that requires less skill perhaps than for comb, because you do not require grading of bees, and it does not matter whether they fill the comb or not, while in comb honey it is necessary to get your sections well filled and not to leave a single cell unfilled.

Mr. BOWMAN : At what time should the bee section be put on the hive to get the comb honey ?

Mr. PICKET : When you find the bees beginning to widen the tops of the combs then put on the section.

R. F. HOLTERMANN : I do not want to take any comb honey before clover comes in. If I find my bees strong and not able to be in the brood chamber, I put an extractor on at first and let them work as they will, and when the clover comes on I remove the extractor and put on the comb and let them go to work.

QUESTION DRAWER.

Q. Is it advisable to cut potatoes for seed or plant them whole ?

Mr. RENNIE : We at first cut our potatoes when growing for exhibition purposes, but during the last year or two have planted them whole, and we never had better results than with the whole potatoes.

Q. Do potatoes give a greater yield in hills or in drills ? Should the end of the potato having the large bunch of eyes be cut off and not planted ? and should they be covered up deep or not ? If they heave the ground will it hinder the growth ? What distance would you put the rows apart, and what distance should the potatoes be apart in the rows ?

Mr. RENNIE : With regard to hills and drills, it depends a little on circumstances. I do not know but what you can get more potatoes to the acre by planting in hills, but it would not be a plan to be recommended for the farmer who is growing a number of acres. The drill is more convenient. Our ground at the farm here for potatoes is plowed, and we are now hauling out manure and will simply cultivate and work it on the surface in the spring and not plow it under. It is a great mistake to plow under manure.

It is not valuable for plant food until it dissolves, and as soon as it dissolves it goes down. When worked on top it is food for the plant when it is growing and it is a mulch at the same time. In potatoes, and especially in all roots, the manure should be kept on the top, and then take the double mould plow, covering them six or seven inches deep it may be, and then harrow down again after the potatoes have been planted a short time. Between the rows of mangels which I used to grow for exhibition purposes there was a perfect mulch of manure and a perfect net-work of fibres; and you can see the mistake it would be to destroy these fibres. It was gone over every day or two with the garden rake to break the crust. The moment you allow that crust to form on the ground you can see the leaves of the mangels wilt. The dew, even, seemed to moisten the soil when properly cared for. While you want cultivation when plants are growing, it must be shallow cultivation, just to break the crust on the surface. Two and a half feet apart is a proper distance for the rows, and in the drills the potatoes should be 12 inches apart.

Q. What would you say is the best remedy for rot? What place in the rotation should the potato occupy?

Mr. RENNIE: Rotation is a broad question. It is well to put potatoes on clover sod, then grain for a year or two, after which have clover and potatoes again.

H. L. HUTT: I know a gentleman in Welland County who plows his clover in the spring, putting the potatoes in every third furrow, and as soon as they come through they are harrowed That is all right for field culture; but where farmers just grow potatoes for their own use I think a good place in the rotation would be following strawberries. I saw very fine potatoes this summer grown after the strawberries were picked. The potatoes were plowed in with the strawberries.

Q. Do you advise shading bee-hives? What is the best time adapted to the purpose?

R. F HOLTERMANN: It depends upon the time of the year. In the spring of the year we want the hive to absorb all the warmth possible. The same in the fall. Through the hot part of the summer is the time, I think, it is advisable to shade. I like to have my hives standing under the outer edges of the trees. The result is that the morning and the evening sun will strike the hives, while during the mid-day they are shaded. The tree I would prefer would be one on which the foliage comes as late as possible in the spring.

Q. What are the most profitable varieties of apples to grow for the market? What do you think of the Ben Davis for exporting?

Mr. HILBORN: The most profitable varieties of apples to grow depends very largely upon the location, and it is the kind of apple you can get the largest percentage of good fruit from that will pay best. Cultivation also has a good deal to do with it. Good cultivation will give good crops of some varieties, and poor cultivation perhaps give no crop at all; while other varieties with ordinary cultivation may give a fair yield. So it is a very broad question. If I knew the location and method of cultivation and some other things, then I might be able to give the name of varieties; but in a general way the Baldwin, Greening, Ben Davis, Golden Russet and Northern Spy have, perhaps, been the best shipping apples of the winter varieties, that is, taking it for the whole of Ontario. The Duchess is, perhaps, the most profitable of all early apples. For an early apple it is a good one, and will ship well, and commands a good price.

Dr. MILLS: Is not the poor quality a great objection to the Ben Davis?

Mr. HILBORN: Yes, but it looks well and carries in the best of condition, and I think will sell for many years to come. There are more advocates of the Ben Davis to-day than there were a few years ago.

Q. Has Professor Robertson's ensilage crop of corn and English beans been tried in the Province?

Mr. KENNY: As far as I understand that question, I do not think that they have been grown to any sufficient extent to decide definitely.

S. HUNTER: I tried the combination myself, and like all the rest of the reports the beans have been a complete failure, but the corn did very well. I grew the sunflowers separately. I think it was a good success so far as the crop was concerned, but cut perfectly green and fed to the cattle they did not seem to fancy them. Whether the effect of the silo will remove that or not I do not know, but unless there is some change the cattle are not going to eat them very readily.

C. A. ZAVITZ: I might say that we grew a large number of beans here this year. We received them from England and Montreal, and I may say that they were a failure here, but of course would not like to say very much about it, as this is the first year that we have had them.

Prof. HUNT: Did they all turn black?

Mr. ZAVITZ: Yes. We secured the horse bean from six different seedsmen. Early in the season the stem and leaves all turned black, a month before the corn would be ready to harvest. I think the hot weather had a good deal to do with it.

J. S. PEARCE: I know of several who have tried this combination, but have not heard what the results of the food have been after coming from the silo. So far as the growing is concerned the corn has been all right, and the sunflowers have been very successful. The beans have been, I think, a failure all over, owing to the effect of the dry weather. English horse beans want a moist soil and plenty of moisture. I have tried them myself and have known quite a few others who have tried them, but have never succeeded owing to the fact that the weather and the sun is too hard for them.

Mr. KENNY: This is not the part of the country to grow beans in. They can raise beans at Ottawa and farther west, but to raise them in this part of the country for a crop I do not think it can be done.

Prof. HUNT: We tried the horse beans, but just as with all the rest of you when the beans got up so high they got black. We tried them both with the corn and without. We have no trouble in growing the corn and the sunflower.

Q. What effect has the freezing of milk upon the quality of the butter. Give causes, symptoms, and treatment of milk fever?

Prof. DEAN: We had a considerable amount of frozen milk last winter, but so far as I could see there was no bad effect on either butter or cheese.

Capt. MCCRAE: What effect has the boiling of milk upon butter?

Prof. DEAN: We have boiled quite a bit. It has the tendency to make the butter soft. We heated it to 160° or 170° for about ten minutes and then cooled.

Mr. KENNY: When getting milk fever the cows first get uneasy. If your cattle are in good condition there is more danger than at other times. The first thing to be given to them is a physic, say, two pounds of salts. Also apply warm water with blankets. I do not know of anything else that can be done. I want to correct one fault among people in regard to milk fever. Most of farmers think that a cow should be milked as soon as she calves; and if there is any danger of milk fever, milk her every two or three hours. I think this is the very thing that will bring it on. On inquiry, I find that when the calves are allowed to suck the cows there is no danger of milk fever; but where they milk and do not allow the calves to suck, you will find the fever. When a cow is fat she is very liable to take milk fever.

Q. How can the country roads in Ontario be best improved?

Hon. JOHN DRYDEN: I do not think I should be asked to answer that question just offhand. It requires a good deal of thought. Another reason why I do not wish to answer it is because I occupy a little different position to most of you. Whatever I say might be put out as coming from the Government. I am watching for this coming convention in Toronto. I find that most of the gentlemen who are writing on the subject do not give us the information we want. They tell you how valuable it would be to have good roads and they leave it there. Now, the question how to get these good roads is going to be one surrounded by a great deal of difficulty. I may say that my

Department is undertaking to get answers to a number of questions which will give us some facts. One will be how many miles of road have we got, say, in an average township? What would it mean to build all these roads after the fashion that some of the gentlemen have been suggesting? Until we have these facts, one can scarcely discuss it intelligibly. I believe we had this subject discussed last year, when we had an admirable paper by Mr. Burns, in which he struck out on original lines. What suits one section of the country, however, will not suit another. The worst road I ever saw was in Essex. Men have had their rigs stuck fast in the middle of the road and have had to get out and walk and leave their rigs there. It is a clay road, and the clay is of that peculiar character which sticks to everything that it comes in contact with, and it gathers on the wheels until they will not run at all. In that part of the country they have no material such as we have in the east, and such as you may have here, out of which to make the road, except the clay itself. I have wondered why, in that country, they do not undertake to use the clay for road-making—why they do not undertake to make brick of the clay and use that for the material. Before doing that, of course, they would have to pay special attention to drainage. Where you have plenty of gravel in many sections of this country, it is only a question of how you will apply the labor. I find that a great many people accept the idea that our system is all wrong and we have to start something new. The system is not so wrong as some of the people. I find that where the people are willing to work it out it answers the purpose quite well, but if they are not it will not work at all. My experience is that on a locality where the roads are near the best of gravel and where it is the easiest thing in the world to make a road, they have got about the poorest roads in the country, for the reason that it is the Queen's highway. In other places where they have a little more public spirit and realize that the building of these roads is something that they are doing for themselves and every person feels an interest in it, you will have no difficulty. It is not for me to say just here what the remedy ought to be, but I think there should be some remedy provided; but I should be very careful before undertaking to sweep away our system just with one stroke and go to taxing the people to build all the leading roads in this country—somebody would begin to find fault. It is all well enough for a man who lives in a town and wants to show off a good driver to want good roads, but when you come to go to these steady-going, hard-working farmers and ask them to put up the dollars for building the roads, they want to know why they should do it. I wish to say that all this agitation, and talking, and writing is similar to the temperance question—although you have no law, you are accomplishing a good deal by talking and thinking about it.

Mr. McKENZIE. We were troubled in our township in the county of Oxford. We have plenty of gravel, and the statute labor system has been in operation with us. The point was should we do away with statute labor and get some other method? They decided to still continue the statute labor system; but this discussion has so educated the people up that they are now demanding better work. I was talking to our township treasurer about the matter, and he came to the conclusion that if we were to build our roads in the best way to do it in two or three years, our farms would not pay for it. We think, by improving our system of statute labor, straightening the roads, etc., that we are going to gradually improve, and as we do, legislation, which is always a slow thing in moving, will bring in new lines and we will adopt them.

Mr. WRIGHT: I would like to find fault with one system that is adopted in our township and in others, that is, for the council to let contracts for gravelling. The jobs are let sometimes to men who do the work properly, and sometimes to men who do it very improperly; but it does not matter so much, in my estimation, who the men are or how they do it if they but take good loads. There are a great many dollars spent also for big stones; and when a wheel strikes one of these stones, it causes a hollow to be made on the opposite side of the road. I think this should be remedied.

F. J. SLEIGHTHOLM: We had a very warm discussion a couple of times in our township council on that question, and it was decided that the great drawback was that there was not a unanimity amongst pathmasters as to what is the proper width or grade for a road. It was suggested that a draft of what constituted a proper road should be got out

and adopted. Some were of the opinion that where the pathmasters knew their business the present system of statute labor was a success. I know that we are now very far ahead, even in our clay roads, where we have no gravel, than we were some years ago. We have now through a large section of that district an excellent road, except at such times as we have an abundance of rain in the spring ; but where attention has been paid and good work done in statute labor, we have a very good road compared to what it was.

Wm. Rennie : I suppose you have all heard about the York roads, outside of those macadamized roads where they have the old toll-gates—there are no worse roads than in the County of York. The reason is not so much because of the labor system, but because of the pathmasters. My idea is that all councils should adopt a system, and that should be carried out by instructions to all pathmasters in that county, and then we would work on some uniform system throughout the county.

Mr. McKenzie : Should you put a drain right down the middle of the road? Would that drain serve the purpose of preventing the frost from going down, or would it pay just as well to have a drain on each side of the roadbed, so that no water would lie in the ditches?

Mr. Waldon : If you get the drain in the centre of the road certainly it would keep the most dry. A tile drain would keep a place drier than an open ditch in any place. I have faith in an underdrain if you can keep it deep enough for the frost not to touch it.

E. Lick : If you are going to use a tile in a road, you must put it below the frost. I know of a drain that the frost froze up, and it was put in three feet deep and six inches of gravel put on top. My advice is to put in two or three lines of tile side by side. From what I have seen of drains in hills, I feel confident that it will pay to put considerable expense in tiling.

Mr. Kenny : If you are going to use tile, why not use it in ditches along the side of the road. Your road is only supposed to be two rods wide, and tile will certainly draw a rod on each side of them. If they will not draw a rod on each side, how is one in the centre going to drain the whole side of the road?

E. Lick : If there is water in the tile in the winter, it will freeze down at the lower end and gradually form until sooner or later it will fill the tile. I have seen where there was a perfect outlet the tiles were frozen full.

Prof. Hunt : If you have a retentive soil, it would probably be well to have a tile in the centre and one on each side of the road ; but where the soil is not so retentive, I think one tile in the centre would accomplish the purpose.

J. S. Pearce : I think this is a very important question, but as Mr. Rennie has said, it is more the fault of the system than the law. I have thought about this thing a good deal, and my idea is that the government or the councils should pass some laws or bills by which they would govern the making of roads, and would have an engineer for every township or county, and the pathmasters would have to be subject to his instructions and build the roads according to instructions. Two essential things to good roads are : first, pathmasters who know their business ; second, keep the one man at it. You should give them something for their labor. I think it would be well if there was one man, a road commissioner, for every township, and have the pathmasters subject to his instructions.

Mr. McKenzie : Last year the question was asked me, should not the Experimental Union do something to protect the farmers against bad seed? I think the Fruit Growers' Association have taken steps to protect themselves, and with some success. I have no plan to suggest for doing this, but I think the seedsmen would do well to keep well informed by this Union ; and those seeds that we recommend, they try to recommend also.

R. F. Holtermann : I see only one way of overcoming this difficulty, that is, keep yourself posted by taking reliable periodicals, etc.

Mr. McKenzie : We sometimes buy seed without vitality and sometimes we do not get the variety. Suppose I go to my market town and say I want such and such a

variety. The seedsman sends to one of the leading seedsmen in Toronto ; if they have not that variety he will come to me and say I have got it. It may have vitality enough but it is not the right variety.

WM. RENNIE : I have known to my own knowledge (I could name the parties if necessary) country dealers, who have told friends of mine that they handled our seeds, and the fact was that they never bought seed from us at all. There is the whole thing in a nut shell. With regard to testing the germinating qualities of seed, I may say that every kind of seed is tested before it is sent out ; and then we also have the trial grounds. You understand that most of the leading seedsmen have their seeds grown on contract, and we make contracts with these men to grow our seeds two or three years ahead, and it is grown just the same as if it were grown on our own farm. This we have no doubt about. Those we do not require to test on the trial grounds. You may depend upon it that if you deal with any of the leading seedsmen in this country you are all right.

Mr. WRIGHT : Where did the bad rape seed come from ?

J. S. PEARCE : I think I can throw a little light on the subject of where the rape seed came from. It came chiefly from one seed house in England ; but that house while they are a fairly reliable house, and had no intention of sending out anything that was wrong, found that their regular stocks were exhausted, and they bought more through brokers and were deceived.

Mr. RENNIE : Of course you are aware that all agricultural societies throughout the country get their seeds in bulk, and of course get it at a reduction. It is just as easy to put up a bushel as a pound of clover seed, and those who buy in bulk get it at the wholesale rates.

J. S. PEARCE : I would suggest to get the seedsmen's catalogues—I do not say mine or Mr. Rennie's, or any other particular person's—and send your order with the money, or a portion of the money. Where we know our customers, we have no hesitation in sending them all the seeds they want ; but we have to lay down the rule that unknown people must be recommended or send the money. With regard to varieties, I would like to say that we have too many varieties, and the great difficulty is to keep them down to a fair number. I want all the members of this Union to understand that, as Mr. Rennie has said, every respectable and responsible seedsman is doing all he can to introduce new varieties that are worthy of introduction and weed out the old varieties.

ANNUAL SUPPER.

After the close of the afternoon session, President MILLS invited all the ex-students and other visitors present to join the College officers and students in the dining hall, to partake of the Matron's hospitality. After supper was served, various toasts were proposed, and fittingly responded to by members of the Union and by visitors, among whom the following might be mentioned : Hon. JOHN DRYDEN, M.P.P., Toronto, and Prof. T. F. HUNT, Columbus, Ohio.

SECOND DAY.

The first item of business was the reading and adoption of the financial statement, which is as follows:

TREASURER'S REPORT.

	Dr.	Cr.
	$ c.	$ c.
To balance from last year	2 30	
" membership fees	60 00	
" Government grant	650 00	
By grains, fertilizers, postage, printing, etc. (agricultural experiments)		414 88
" potatoes, printing, postage, etc. (horticultural experiments)		38 14
" printing, postage, self-hivers, etc. (apicultural experiments)		21 05
" printing, etc. (botanical and entomological experiments)		7 73
" reporting meeting, editing report, etc		50 00
" travelling expenses of officers, circulars, programmes, etc		40 42
" Secretary's salary		25 00
" expenses of speakers at meeting		40 05
" balance on hand		75 03
Total	712 30	712 30

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 have found them to be correct.

O. A. C., GUELPH,
December 22nd, 1893.

Signed { JAS. ATKINSON,
W. J. BROWN.

OFFICERS AND COMMITTEES FOR 1894.

The next business taken up was the report of the Nominating Committee. The election of officers resulted as follows:

Honorary President ..... Prof. H. H. Dean, O. A. College, Guelph.
President ..... Allan Shantz, B. S. A., Waterloo, Ont.
Vice-President ..... C. A. Keil, Chatham, Ont.
Treasurer ..... G. F. Marsh, B. S. A., London, Ont.
Secretary ..... R. F. Holtermann, Brantford, Ont.
Editor ..... C. A. Zavitz, B. S. A., O.A. College, Guelph.

AUDITORS.

Jas. Atkinson, T. F. Patterson.

Delegate to Central Farmers' Institute—R. F. Holtermann, Brantford, Ont.

COMMITTEES ON EXPERIMENTS.

Agriculture—C. A. Zavitz, B.S.A. (Director); Pres. Mills, Prof. Shuttleworth, Jas. Atkinson and R. Harcourt, B.S.A.
Horticulture—H. L. Hutt, B.S.A. (Director); E. Lick, N. Monteith, B.S.A.
Apiculture—R. F. Holtermann, (Director); R. M. Husband and E. G. Emigh.
Dairying—Prof. H. H. Dean, (Director); H. L. Beckett, B.S.A., and S. P. Brown.
Economic Botany and Entomology—Prof. J. H. Panton, (Director); G. A. Robertson and H. Harrison.

DISTRICT OR COUNTY SECRETARIES.

Name.	County.	Post Office.
W. A. Mattice	Stormont	Cornwall.
S. G. Carlyle	Dundas	Chesterville.
G. G. Shirreff	Russell	Clarence.
E. G. McCallum	Glengarry and Prescott	Martintown.
J. C. H. Sparrow	Carleton	Antrim.
P. McLaren	Lanark	McGarry.
W. Lindsay	Leeds and Grenville	Loch Winnoch.
J. C. Stagg	Frontenac	Brockville.
B C. Brown	Lennox and Addington	Kingston.
D. Aylsworth	Renfrew	Bath.
D. H. Leaven	Hastings	Belleville.
W. M Newman	Prince Edward	Gilbert's Mills.
Wm. Wiancko	Muskoka	Sparrow Lake.
Wm. Morrison	Haliburton	Minden.
F. J Davidson	Peterborough	Peterborough.
W. Carlaw	Northumberland	Warkworth.
J. L. Fair	Durham	South Monaghan.
T. H. Tinny	Victoria	Oakwood.
S. P. Brown	Ontario	Whitby.
R. A. Thompson	Simcoe	Thornton.
G. A. Brodie	York	Bethesda.
J. A. B Sleightholm	Peel	Humber.
W. Ewing	Dufferin	Mulmur.
E. P. White	Grey	Clarksburg.
A. R Vannater	Wellington	Ballinafad.
H. Black	Halton	Scotch Block.
H. L. Beckett	Wentworth	Hamilton.
J. Harcourt	Lincoln	St. Anns.
A. M. Soule	Welland	Southend.
D. Z Gibson	Haldimand	Willow Grove.
Allen Shantz	Waterloo	Waterloo.
G. C. Emigh	Oxford	Holbrook.
G. N. Hunter	Brant	St. George.
B. E Kitchen	Norfolk	Waterford.
Jno. Buchanan	Huron	Hensall.
N. Monteith	Perth	Stratford.
J. B. Muir	Bruce	North Bruce.
E. M. Husband	Middlesex	Cairngorm.
C. R. Stevenson	Elgin	Fingal.
N. J. Clinton	Essex	Windsor.
Wm. Dolsen	Kent	Chatham.
A. E Wark	Lambton	Wanstead.

MISCELLANEOUS MOTIONS.

The different committees, having fully considered their individual requirements, decided to ask the Legislature for an additional grant of $100, and a motion was carried to that effect.

Upon motion of Mr. E. LICK, seconded by R. F. HOLTERMANN, Mr. C. A. Zavitz was granted the sum of $80 as a partial remuneration for his valued services in connection with the Union.

Moved by F. J. SLEIGHTHOLM, seconded E. M. HUSBAND : That the time has come when it is desirable that every effort should be made to bring the results of our experimental work prominently before the farmers of this province ; therefore we would respectfully submit to those who arrange the work of farmers' institutes that a Union member or other person qualified be sent with each delegation who shall be prepared to briefly indicate the work of the Union and give results of the experimental work. Carried.

A vote of thanks was also tendered to the press for giving reports of the proceedings.

SHEEP AS PROFITABLE FARM STOCK.

The following paper was prepared by JOHN HARCOURT, St. Anns, Ont., and read by Robt. Harcourt, O.A.C. :

At the present time when hired help is so scarce and wages accordingly high we are instinctively looking for some way by which we can keep up our incomes without so much outside help. One of these ways I believe to be the keeping of more sheep. Many look upon sheep as objectionable stock because of their tendency to bite the heart out of clover and to eat the pasture so close that there is no protection for the ground from the burning sun of mid-summer, thus stopping the growth of the grass and destroying the vitality of the plants. While this is true, especially on heavy land, if the run is too limited, yet I cannot but say something in favor of the gentlest of all farm stock. They require the least labor and time in caring for them. They are the first stock to be turned out in the spring and last to require care in the fall. The only time when breeding ewes require special attention is during lambing time and even then the work is not arduous.

The shelter necessary for wintering them comfortably need not be so expensive as for other stock. A good frame building with a tight roof is all that is required except where early lambs are raised ; then a warmer room for lambing will be necessary. While I believe this is all the shelter that sheep require, I would just say that there are those who claim that it is just as profitable to feed sheep in warm stables during winter as any other stock. I know of sheep that are being kept in a bank barn as warm as the cattle, with scant room for moving about, and with little or no outside exercise.

Sheep are as easily pastured during the summer as any other stock. Where only a small flock is kept they do not require so much pasture in proportion, for they will pick off every odd corner about the farm, and if they have the chance will help materially in the cleansing of a dirty farm. A large number of fields especially in the poorer parts of our province would give better returns if used as sheep pasture than they do under the present method of raising light crops of grain at a loss ; for the cost of putting in a crop on a poor hard field is greater than the cost of putting in the same crop on a rich one. Rape has come into great use in the feeding of sheep, not only as a crop grown by itself, but also sown with oats to be pastured after the oat crop has been harvested. The same might be done with a corn crop for lamb pasture. The time is coming when those who wish to push a large flock of sheep along well and cheaply will hurdle them on a crop of oats and vetches. Breeding ewes will do well during the first part of winter on pea straw with a little hay and a very small amount of grain, but as lambing time approaches stronger feed will be required.

Sheep leave their droppings much more evenly over the field than do either horses or cattle. Horses leave the greater part of their manure on the already rich low land, while sheep congregate and leave considerable of theirs on the high and poorer land where it is needed.

Early lambs, if large enough for Easter market, bring in the best returns; in fact the sooner lambs are marketed the more profitable they will be found. Higher prices will be received and the ewes can be kept cheaper when the lambs are gone. A good flock of ewes will raise an average of one and a half lambs to the ewe Many flocks do more than this. At an average of three dollars and a half per head for the lambs and one dollar per head for the fleece each ewe will bring in six dollars and a quarter. When everything, time, labor, food and shelter is taken into consideration we may look upon this as a good return. This is what is being done every year by those who take very little care of their sheep, and where early lambs and higher prices are received the returns are correspondingly better. To those who are willing to put in more capital, more care and better feed, pure-bred stock gives a better return.

Mr. MASON: I have had some experience with sheep, and have always raised a few of them. With regard to the point raised about keeping them in a warm pen in bank barns, I do not think it is advisable. On the whole, I think the health of the sheep is better if they have just an ordinary frame shelter or anything else, the main point being to keep them thoroughly dry over head and under foot. They want good shelter and plenty of liberty. I think it is a good plan to have doors arranged so that they may go out and in at will. I sold this year for 1½ c. per pound less than I received last year. The buyer had been in business for 30 years, and he told me that he had sold a load of lambs at $4.20 live weight, which was the lowest he ever received. This, of course, is very discouraging. However, I am not sick of the sheep yet. We had nearly as bad a depression in 1877; and as a consequence every person went out of sheep. In about three years, in 1881, things were good in the sheep business, and every person was anxious to get in sheep I think we are just repeating the same experience. We cannot expect to recover in one year, however.

Dr. MILLS: What did your lambs net you this last year?

Mr. MASON: Less than $3 a piece, weighing about 90 lb. each. I sold in the latter part of October or first of September.

Dr. MILLS: What is the best time for early lambs to come in?

T. H. MASON: As early as you can get them. If you can get them in January or February it is all the better.

F. J. SLEIGHTHOLM: From what knowledge I have of live stock, one of the first questions that presents itself to me is at what price can we produce an article in live stock and put it on the market at a profit? It is not so much a question with us what the price of an animal is, as the profit at any given price. We want to know if at the present low prices we can produce sheep at a profit. What does it cost in cents at from seven to eight months?

R. S. SHAW: In calling upon me to speak, I do not know whether you expect me to answer Mr. Sleightholm's question or not. I think it is a very difficult question to answer, and one which I do not think it would be possible for me to answer. At the present time, we are handling quite a number of sheep, but being somewhat differently situated to what a number of sheep breeders may be, it pays us to keep a number of sheep, although the prices are low, owing to the fact that there is a certain amount of feed which can be used by the sheep, which would be lost if we depended upon other animals to use it There is also another point which one of the speakers mentioned in regard to sheep, that the prices would probably be lower next year. Well, it is a good idea, has been in many instances, when prices are low, when others are going out of a certain line, to get into it to be ready for the rise. Pork, for instance, has been a very good price of late, and the probabilities are that a great deal of pork will be produced for some time. Of course, we have no surety as to what the prices will be, but should we not watch carefully and not have a large supply of pork when the prices drop. At the same time, while mutton is low, should we not be on the lookout to have a supply, should the demand and price increase?

Mr. McKenzie: We know that it is the practice to rush out of one thing into another. We can go out of the sheep business quickly, but in cattle it takes longer to make a change, and if we make a mistake we are sure to lose some money.

T. H. Mason: I think it better on the whole for a person to keep a steady, uniform supply of all the classes of stock best adapted to his farm and to his liking. This everlasting going in and out of things is what does the mischief.

Robt. Harcourt: With regard to the question of keeping sheep in a bank barn, I think the same as Mr. Mason, that sheep as long as they have a dry shelter, above and below, it is all that they need, except at lambing times. A certain party in our neighborhood has made a practice for three years of feeding lambs in a bank barn along with his cattle and huddled so close together that they would not be allowed more than four feet square to each animal, and the fleeces are all damp. I cannot see how the sheep did well, but he is satisfied that they did better than in an open shed.

E. Dunn: With regard to keeping sheep in warm stables, I think it can be done with profit. Our sheep are kept in the bank barn all the time, and in a place just about as warm as where the cattle are. By a warm stable for sheep, we mean one that is moderately warm—water will freeze in the stable, but not solid, in the colder days. They must have fresh air, and their fleeces get wet if they are kept in three or four days. If they are kept warm, they do not need so much food to keep up the animal heat and if they are kept outside you will see them with their backs humped up, and if they are cold the lambs will lie on their backs, which causes the wool to mat. My experience is that they can be kept in a warm stable with profit.

J. F. Clark: I have not had very much experience in sheep-breeding, but we keep 30 or 40 usually. We are unfortunately situated in P. E. Island on account of winter communication. The only way to get across the channel is by ice-boats. On the ice-boats there is not much chance of transporting sheep at the best and so we cannot ship at the time that prices are best. The Island, I think, is very well adapted for sheep raising. Our mutton and our lambs bring the very highest price in the United States, also in Canada. I saw the P. E. I. mutton selling at 18 cts. a pound alongside of 8 cts. per pound mutton; and I believe American people who are judges of first-class quality of mutton put the P. E. I. productions at the very top as regards quality.

REPORT OF EXPERIMENTS IN AGRICULTURE.

The following report was presented by C. A. Zavitz, B.S.A., Agricultural College Guelph:

There were thirteen distinct co-operative experiments in agriculture conducted by the Association during the past year, two were with fertilizers, three with fodder crops, three with root crops and five were with grain crops. Two years ago 2,642 packages of fertilizers and seeds were distributed, one year ago 5,688 packages were distributed and during the present year no less than 7,181 packages were sent out to members of the "Union" and other interested farmers throughout the province. Nothing was sent out but choice material, both in regard to quality and variety. The seeds and fertilizers were forwarded to twelve hundred experimenters over Ontario, and not one complaint has been received from the experimenters regarding the quality of the material sent or the manner of preparing the same. The majority of those who carried on experiments in 1893 forwarded us reports after the crops were harvested. Great care has been exercised in selecting only the full reports of carefully-conducted tests for the summary report here presented. Four hundred and sixteen experimenters sent in satisfactory reports which are certainly of very great value, and those who conducted the work deserve much credit. These successful reports were from all parts of Ontario, sixteen coming from Muskoka, eleven from Parry Sound and six from Algoma. Less than five per cent. of the experimenters for 1893 have mentioned that they were unable to continue the work another year, while hundreds have expressed a desire to continue the work in 1894.

The following circular was sent out in February to members of the Association, previous experimenters and to others who applied for seed of different kinds :

DEAR SIR,—The members of the Ontario Agricultural and Experimental Union, along with other interested farmers over Ontario, are carrying out a system of co-operative experiments in agriculture. This work was started upon its present plan in the spring of 1886 with twelve experimenters, who received the grains and fertilizers, carried out the necessary instructions, and reported the results at the end of the season. For the first two or three years the experiments were confined almost entirely to the ex-students of the Agricultural College, but as many other farmers expressed a desire to join in the work, the invitation was extended to them also and material was sent to those who applied on the condition that they would be careful to follow the necessary instructions and report the results of their tests after harvest. The work has steadily increased since its commencement, and during the past two years the Association has been unable to supply the material to the full number of applicants, owing to the demand being so great In 1891 there were 2,642 plots, and in 1892 there were upwards of 5,000 plots used for these co-operative tests over Ontario. Reports of successful and interesting experiments were received during the past year from every county in Ontario, with the single exception of the county of Russell.

The members of the Committee on Agricultural Experiments are pleased to state that for 1893 they are again enabled to distribute into every township of Ontario material for experiments with fertilizers, fodder crops, roots and grains. Upwards of 700 varieties of farm crops have been tested at the Experiment Station, Guelph, during the past four years. These consist of nearly all the Canadian sorts and about four hundred new varieties imported during the past six years from different parts of Europe, Asia, Africa, New Zealand, and the United States. Some of the kinds have done exceedingly well and are now being distributed over Ontario in small quantities. Great care is exercised in sending out really choice varieties.

Prosperous farmers need not find much difficulty in conducting any of these experiments successfully, but care will certainly need to be exercised in every instance, and where this is done the committee feels assured that the experimenters will be far more than repaid for all the time and labor expended. Each experimenter will glean information from his own work and also have the benefit of the report of similar experiments from other parts of Ontario. The results of carefully conducted experiments are presented in summary form to the annual meeting of the Association, held in December at the Agricultural College, Gnelph, and are afterwards printed more fully, along with the proceedings of the meeting, in the annual report of the College. Each experimenter is invited to this annual gathering of the Association and has forwarded to his address a copy of the report.

Each person who wishes to join in the work may choose any one of the experiments for 1893, fill out the accompanying form of application and return the same to the Secretary at as early a date as possible. The material will be furnished in the order in which the applications are received until the limited supply becomes exhausted. A sheet containing the instructions for conducting the various tests and the blank forms 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 plot will, of course, become the property of those who conduct the experiments. In return the Committee desires to ask that each experimenter be very careful and accurate in his work and forward to the Secretary by October 25th, 1893, a complete report of the results obtained from the tests.

Along with the above circular, the following list of experiments for 1893 was sent, to which the blank form on which each person could make his application was attached :

No.	Name of experiments.	Plots for each.	Size and shape of each plot.
I.	Testing nitrate of soda, superphosphate, muriate of potash, mixture, and no manure with oats	5	2 rods x 2 rods.
II.	Comparing the advantage of nitrate of soda and superphosphate over no fertilizer with rape	3	2 " x 1 "
III.	Ascertaining the relative value of three varieties of millet	3	2 " x 1 "
IV.	Growing lucerne as a crop for fodder	1	4 " x 4 "
V.	Testing six promising varieties of fodder corn	6	1 " x 1 "
VI.	Testing five promising varieties of turnips	5	1 " x 1 "
VII.	Testing five promising varieties of mangels	5	1 " x 1 "
VIII.	Testing five promising varieties of carrots	5	1 " x 1 "
IX.	Testing six promising varieties of spring wheat	6	1 " x 1 "
X.	Testing six promising varieties of barley	6	1 " x 1 "
XI.	Testing six promising varieties of oats	6	1 " x 1 "
XII.	Testing four promising varieties of peas	4	1 " x 1 "

Material for No. I experiment will be sent by express, and for each of the others it will be forwarded by mail. 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 the 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 *numbers* shown in the left hand column of the table given above. Particular varieties need not be mentioned as all the kinds to be distributed are those which have done exceptionally well upon the trial plots at the Experimental Farm.

FORM OF APPLICATION.

To be filled and returned to C. A. Zavitz, Agricultural College, Guelph, Ont.

Experiment chosen (*indicate by number*) { First choice / Second choice

Name — Line of railway

Post office — Township

Express office — County

The demand for material for the co-operative experiments in agriculture for 1893 surpassed that of any previous year. We were enabled to supply nearly all the applicants with what they desired except those who applied late in the season. Material was sent into every county of Ontario, and also into the majority of the townships of the province. At the time the seeds were forwarded to the various experimenters, instructions for conducting the different tests were also sent as well as the following letter, informing the applicants that the experimental material was being forwarded :

DEAR SIR, —Your reply to our letter regarding the co-operative experiments for Ontario during 1893 has been received. We wish to inform you that we are forwarding to your address the material for the experiment or experiments which you chose from the list in the circular letter sent to you. If you have asked for No. 1 experiment, the material is addressed to your nearest express office; but if your application calls for any of the other experiments, the material is forwarded to you by post. This sheet gives the "Instructions" for conducting and the "Blank Forms" on which to report the results of the different experiments with fertilizers, fodder crops, roots and grains. Should you desire any further information regarding your experimental work, kindly write us to that effect.

For each experiment soil of a uniform character should be chosen, and the plots should be so located that there would be no danger of trespassing by poultry, etc. The preparation of the soil should be similar to that for the same crops in the larger fields.

We hope the material which we have forwarded will reach you safely, and that you will have good success with your experimental work.

During 1893 there were four hundred and sixteen full reports of successful experiments received. Eighty-two experimenters sent in good reports of part of the varieties sent them, but these reports along with all of those which indicated carelessness in any way, are not included in the report here presented. Eighty-three experimenters mentioned failure from bad weather, and fifty-nine from the ravages of the grasshoppers.

To show the broadness of the work it might be mentioned that sixteen successful reports were received from Muskoka, eleven from Parry Sound, and six from Algoma.

The following table shows the progress of the co-operative experimental work in agriculture for the past eight years. Nothing is here mentioned except the purely successful part of the work, all partial or unsuccessful reports being discarded.

Successful Experimental Work for 8 Years

Years.	Distinct experiments.	Successful reports.	Number of plots used for successful experiments.
1886	1	8	33
1887	1	27	135
1888	1	40	240
1889	4	21	76
1890	6	20	64
1891	12	126	662
1892	12	295	1585
1893	13	416	2105

The results of the experimental work for the past year are not only very interesting but they are also very valuable. The uniformity of results for 1892 and 1893 are very marked. The fertilizers used with oats hold the same relative position in the results of the present year as they held in the results of 1892. The varieties which stood first in

yield per acre last year, also in nearly all cases, claim the same high position in the average results for 1893. There is also a marked uniformity of results of the co-operative experiments for the past two years, and the farm experiments for the past two, three, four and five years.

I. FOUR FERTILIZERS, AND NO FERTILIZER WITH OATS.

(1) Upon uniform land, which has received no manure for at least four years, mark off five plots of one-fortieth of an acre each, leaving a clean path, three feet wide between the plots. Two rods square is the size recommended.

(2) Treat all plots alike as regards cultivation of ground, etc., and sow the packages of Bavarian Oats upon the five plots, as indicated by the labels on the bags. Aim at seeding one inch deep, and cover the seed by going crosswise over the plots with a light harrow, or by using a hand rake.

(3) Apply the fertilizers upon their respective plots, as indicated by the labels on the bags.

(4) When the plants are three or four inches high, cut off all those outside of the plot limits.

(5) Your safest method of harvesting would probably be to cut the crops with a cradle after the oats have become sufficiently ripened, and then, when properly dried, thresh with a flail.

Individual results of twenty experiments.

Experimenter.	County.	Nature of soil.	Cropping of 1892.	How and when last manured.	Weight of oats per plot.				
					Mixture.	Nitrate of soda.	Muriate of Potash.	Superphosphate.	No fertilizer.
					lb.	lb.	lb.	lb.	lb.
Jas. Clark	Glengarry	Gravelly loam.	Oats, 1892	1887, b.y.m.	39	33	28	28	27
David McCrae	Wellington	.....	.....	.....	51	50	38	42	34
D. Hartley	Halton	Light	Turnips	Never	37	34	35	34½	24½
Frank Shuh	Waterloo	Sandy loam	Fall wheat	1890	29½	27½	25½	24	24½
Thos. Wheatley	Grey	Clay loam	Clover	1886	24	30	26	36	20
C. M. Honsberger	Lincoln	Gravelly loam.	Corn, 1892	1889	33¾	31	32½	27½	25½
as. W. McLean	Lambton	Clay loam	Oats	Never	32½	30	31	31½	28
as. M. Henderson	Middlesex	"	Fall wh't, 1892	1889	20	25	25	27	19
N. C. Brown	Elgin	Sandy loam	Corn	1892, b.y.m.	39	48	34	36	40
David H. McCallum	Middlesex	Clay loam	Oats	1887	15½	14½	13½	14	8½
Jno. Smailes	Elgin	Sandy loam	Fall wheat	Never	40	31	44½	35¾	26¾
T. C. Wheatley	Lambton	Swamp muck.	Pasture	"	20	13½	20	16	17½
Jos. Mountain	Perth	Clay	Barley	"	36	35	46	38	28
Wm. Marjerrison	Glengarry	Black loam	Potatoes	1888	45	43	35	34	30
W. T. Gale	Nipissing	Clay loam	Peas	Never	55	42	28	30	36
A. G. McKenzie	Oxford	"	Potatoes	.....	42	44	39	38	42
Jackson Montgomery	Algoma	Sandy loam	.....	.....	28	24	32	22	20
Robt. Keppy, jr	Parry Sound	"	Oats	.....	20	24	20	22	17
Geo. Hopf	Grey	Heavy clay	"	1889	50	38	47	43	38
Jno. A. McDonald	York	Clay	Corn	"	44	38	40	36	28

The mixed fertilizer was made up of Nitrate of Soda, Muriate of Potash, and Superphosphate in the proportion of 1, 1 and 2 by weight. The Nitrate of Soda was applied when the plants were about two inches in height, and the muriate of potash and Superphosphate were applied at the same time as the seed was sown. The following table shows the amount applied and the cost per acre of each fertilizer used :

Fertilizer.	Quantity applied per acre.	Cost per acre.
	lb.	$ c.
Mixture	213	4 35
Nitrate of Soda	160	4 40
Muriate of Potash	160	4 48
Superphosphate	320	4 16

Average results of twenty experiments :

Fertilizer.	Yield of straw per acre.		Yield of grain per acre.	
	1893.	Average 2 years, 1892-3.	1893	Average 2 years, 1892-3.
	tons.	tons.	bush.	bush.
Mixture	1.18	1.31	41.3	47.2
Nitrate of Soda	1.21	1.30	38.6	43.3
Muriate of Potash	1.17	1.22	37.6	40.8
Superphosphate (mineral)	1.20	1.18	36.2	39.3
No fertilizer	1.00	1.09	31.4	35.9

CONCLUSIONS.

(1) The average results obtained by twenty experimenters over Ontario in 1893 show that the fertilizers increased the oat crop as follows : Mixture—grain 9.9 bushels, straw .18 ton ; nitrate of soda—grain 7.2 bushels, straw .21 ton ; Muriate of Potash—grain 6.2 bushels, straw .17 ton ; Superphosphate—grain 4.8 bushels, straw .2 ton.

(2) The mixed or "complete" fertilizer gave an average increase yield of 31.5 per cent., the nitrate of soda 22.9 per cent., the Muriate of Potash 19.7 per cent., and the Superphosphate 15.3 per cent. of oats over no fertilizer.

(3) The grain crop was almost doubled upon some soils by the use of fertilizers, while upon others it was influenced to a very limited extent.

(4) In eleven experiments out of twenty the mixed fertilizer gave the highest yield of grain per acre.

(5) In seventeen out of twenty experiments the fertilized plots gave a greater average yield of grain than the unfertilized.

(6) The earliest maturing grain was produced on the plots which had received the mixed fertilizer in both 1892 and 1893.

(7) The shortest average straw was produced on the unfertilized plots in 1893 as in 1892.

(8) The fertilizers occupy the same relative position in regard to yield of grain per acre when applied on either heavy or light soils.

II. SODIUM NITRATE AND SUPERPHOSPHATE WITH RAPE.

(1) From a section of ordinary land, to which no manure has been applied for at least four years measure out three uniform plots, each one rod wide by two rods long, and leave a path three feet wide between each two plots.

(2) Prepare the soil for rape in much the same manner as you would that for a root crop.

(3) In each plot make eight drills, two rods long, leaving twenty-five inches between the rows.

(4) During the last week in June, sow the two packages of rape seed upon their respective plots.

(5) Sow the superphosphate at time of seeding upon No. II. plot, and when the young plants are about two inches high, sow the package of sodium nitrate upon plot No. I., after which stir the soil in each plot.

(6) Cultivate the land in the same manner as you would that having a root crop.

(7) About the 20th of October cut the rape and immediately weigh the crop from each plot.

Results from one experiment.

Experimenter.	County.	Nature of Soil.	Cropping of 1892.	How or when last manured.	Yield of green rape per acre.		
					Nitrate of Soda.	Superphosphate	No fertilizer.
					tons.	tons.	tons.
D. Aylesworth	Lennox	clay loam	pasture	f. y. m. 5 or 6 years ago.	9.2	5.1	4.0

Nitrate of soda was applied when the rape plants were about two inches high. It was sown broadcast at the rate of eighty pounds per acre. The cost price of the fertilizer was $2.20 per acre. The Dwarf Essex variety of rape was used, which was obtained in Ontario.

Conclusions.

(1) The demand for rape seed for experimental purposes is still very limited in Ontario.

(2) The plot which received nitrate of soda produced more than double the amount of green rape, which was produced from the unfertilized plot.

(3) The increase in the rape crop caused by the application of nitrate of soda was made at a cost of forty-two cents per ton.

III. TESTING THREE VARIETIES OF MILLET.

(1) Measure off three uniform plots, each two rods long by one rod wide, leaving a path of two feet between each two consecutive plots.

(2) Prepare the land similar to that for a corn crop.

(3) Sow broadcast the three packages of millet seed upon their respective plots during the first week in June. Aim at seeding one inch deep.

(4) Cut the crop as soon as all the heads are in appearance.

(5) Weigh the produce from each plot immediately on cutting.

Individual results of two experiments.

Experimenter.	County.	Nature of soil.	Cropping of 1892.	How and when last manured.	Yield of green millet per plot.		
					Salzer's Dakota.	Golden Wonder.	Common.
					lb.	lb.	lb.
G. S. McTaggart	Hastings	black-muck.	pasture		60	48	30
A. G. McKenzie	Oxford	clay	fall wheat	f. y. m. 1893	132	123	95

Average results of two experiments.

Varieties.	Average height of plant.			Yield of green crop per acre.		
	From four tests, 1892.	From two tests, 1893.	Two years, 1892-3.	Four tests, 1892.	Two tests, 1893.	Average two years, 1892-3.
	in.	in.	in.	tons.	tons.	tons.
Salzer's Dakota	51.0	24.0	37.5	9.3	3.9	6 6
Golden Wonder	31.7	23.0	27.4	7.1	3.4	5.3
Common	33.0	19.0	26.0	5.8	2.5	4 2

Conclusions.

(1) The Salzer's Dakota millet surpasses the other varieties in yield per acre in each of the co-operative experiments for 1893.

(2) The Salzer's Dakota millet gave an average increase yield per of green fodder of 55.8 per cent. in 1892, and 53.6 per cent. in 1893 over that of the common millet in the co operative experiments.

(3) The Salzer's Dakota millet possesses a large amount of leaf, and is the tallest grower of the varieties in the test.

IV. THE GROWING OF LUCERNE.

(1) Select a one-tenth acre plot, conveniently situated to the stables, and in such a position that it may remain unbroken for a number of years.

(2) Cultivate the ground thoroughly, making a fine seed bed.

(3) Sow the 1.8 pounds of lucerne in the same way as you would seed with red clover.

(4) If there is a heavy crop of lucerne in the autumn, cut high; if the crop is light, leave uncut.

Individual results of nineteen experiments

Experimenter.	County.	Nature of surface soil.	Nature of sub-soil.	Character of drainage.	Remarks.
Jas. Edmondston	Grey	sandy loam	gravel	stone drain	it was 6 in. to 1 ft. high, light and uneven.
J. E. Dyer	Durham	clay loam	red loam	good	cut it once, allowed horses to eat it down once, also pastured sheep on it, and it is getting thicker all the time.
Robt. Keppy, jr.	Parry Sound dis.	sandy loam	clay	under drained.	the lucerne was quite uniform.
Wm. Young	Lambton	alluvial deposit	"	tile drain	about 1 ft. high and very uniform.
R. C. Twiss	Middlesex	clay loam	"	surface	did very well although tested severely with a heavy crop of oats and a very dry fall, was about 6 in. high.
Benj. Mannen	Brant	clay loam	"	fair	uniform and about 8 in. high.
J. H. Garbutt.	Peterboro'	light loam	hard-pan	good	the grasshoppers stripped the leaves.
S. J. Hogarth	Exeter	clay loam	heavy clay	natural slope	although fairly uniform was thinnish and plants slender.
John Hazel	Norfolk	sod	sand	none	looked well but burnt to ground by drouth, later rains recruited it very much indeed.
James A. Kidd	Simcoe	clay loam	clay	tile	fairly uniform and about 6 in. high.
R. DeLaMatter.	Lincoln	clay	"	surface drainage	quite uniform and knee high.
A. G. McKenzie	Oxford	clay loam	"	poor	8 in. high in Sept. and uniform.
W. I. Cook	Monck	sandy	sand	natural	I like it and think it will do better than red clover on poor soil.
H. Smith	Huron	strong clay l'm	clay	none	germination good and growth satisfactory until dry weather set in.
C. H. B. Angell	Wellington	black loam	sandy	none	quite uniform.
Wm. Scott	Stormont				from 10 to 24 in. high.
Crawford Scott	Stormont	loamy			about 13 in. high.
D. Kennedy	Peterboro'				a good crop, 1 ft. high, well pleased.
Jane Burt	Wellington				about 15 in. high in Sept.

Average results of nineteen experiments.

Crop.	Number of days required to germinate, 1893.				Height of plant in autumn, 1893.			
	Minimum.	Maximum	Average.	Average two years, 1892-3.	Minimum.	Maximum	Average.	Average two years, 1892-3.
Lucerne.....	7	26	13.5	11.4	4	24	10.5	12.4

The lucerne seed was obtained in Ontario. It was sown broadcast at the rate of eighteen pounds per acre. In most instances no additional crop was sown with the lucerne, and with but few exceptions the plants were left uncut during the present year.

Conclusions.

(1) The remarks of the experimenters are quite encouraging regarding the growth of lucerne the first summer after sowing.

(2) A large crop of lucerne cannot be expected during the first season after sowing.

(3) From seed sown in the spring of 1892 some experimenters speak of total failure by winter killing, etc., while others report of having two, three, and even four cuttings of the lucerne crop during the present year.

V. TESTING SIX PROMISING VARIETIES OF CORN.

(1) Measure off six plots each one rod square.

(2) Mark out each plot into five rows both ways, allowing in every case 3 feet 4 inches between each two consecutive 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 four inches high, thin out to four plants per hill.

(5) Cultivate all the plots alike and take necessary notes during the summer for the report.

(6) Cut each variety before frost and at the time when its stage of growth corresponds to the roasting conditions of field corn, or when the ears are in the glazed state.

Average results of 35 experiments.

Varieties.	Average of 35 co operative tests, 1893.		Average of Experimental Farm tests—2 years, 1892-3.	
	Weight of green ears per acre.	Total weight per acre.	Weight of green ears per acre.	Total weight per acre.
	tons.	tons.	tons.	tons.
Mammoth White Surprise	2.4	17.5	1.1	24.3
Thoroughbred White Flint.....	3.5	15.9	2.1	22.2
Giant Beauty.....	3.0	15.5	3.7	23.0
Mammoth Cuban.....	3.4	15.2	3.9	19.7
Wisconsin Earliest White Dent.....	3.6	14.1	3.9	17.0
Salzer's North Dakota	3.5	13.2	3.4	18.4

The seed of all the above mentioned varieties of corn was obtained from the United States, with the exception of that of the Thoroughbred White Flint, which was obtained from an Ontario seedsman.

Individual results of 35 experiments.

Experimenter.	County.	Date of seeding.	Nature of soil.	Cropping of 1892.	Weight of whole crop per plot.					
					Mammoth White Surprise.	Thoroughbred White Flint.	Giant Beauty.	Mammoth Cuban.	Wis. Earliest White Dent.	Salzer's North Dakota.
					lb.	lb.	lb.	lb.	lb.	lb.
John McKee	Oxford	June 1st	clay loam	hay	250	170	185	165	160	140
Robert Bandeen	Elgin	May 25th	sandy loam	wheat	255	240	200	225	186	236
W. G. Robertson	Dundas	" 23rd	"	oats	263½	256	213	234	196½	187¾
F. H. Patterson	Lincoln	June 8th	black loam	wheat	221	123	165	117	122	131
A. S. Hodgins	Stormont	May 30th	sandy loam	buckwheat	188	152	244	208	256	240
Jonathan Cross	Prescott	June 1st	"	fodder corn	275	325	300	225	250	200
John Heard	Grey	May 30th	gravel loam	corn	375	262	300	400	237	175
Wm. Merkley	Dundas	" 27th	"	"	170	100	155	150	100	150
D. Macfarlane	Par. Sound (D)	" 18th	clay loam	potatoes	340	355	333	367	330	341
Robert Wilson	Bruce	" 30th	l. s. loam	oats	318½	291	300	285	227½	218¾
E. Chambers	Welland	June 3rd	muck	oats & g. peas	220	275	220	195	225	190
A. Wiancko	Muskoka (Dis)	May 29th	clay loam	potatoes	152	153	160	142	165	126
Samuel Hunter	Wentworth	" 31st	sandy loam	oats	370	310	250	270	235	287
P. S. McLaren	Lanark	" 29th	"	turnips	188	211	148	120	124	136
Joshua Knight	Frontenac	" 20th	clay loam	potatoes	324	324	330	336	216	228
Geo. R. Thomson	Essex	" 25th	black loam	clover	350	225	200	152	225	163
Wm. Sutherland	Oxford	June 3rd	clay loam	oats	207½	193	139½	192	107	100
John A Walker	Lanark	May 30th	"	potatoes	130	110	110	125	122	162
Wm. Johnston	Elgin	" 2 th	sandy loam	"	450	460	450	442	440	400
Thos. Henderson	Wentworth	" 27th	"	oats	256	386	236	154	205	236
Robert Ford	Essex	June 5th	clay loam	potatoes	214	170	184	166	143	110
V. E. Gamley	Bruce	" 16th	"	spring wheat	195	160	200	190	180	175
D. C. Gardiner	Huron	May 26th	"	oats	300	200	275	300	300	250
Joseph Mountain	Perth	" 27th	"	grass	210	150	180	270	160	240
Wm. Marjerrison	Glengarry	June 2nd	black loam	wheat	350	275	300	300	300	100
A. G. McKenzie	Oxford	" 12th	clay loam	fall wheat	153	132	137	153	122	107
Walter Carlaw	North'mberl'd	" 9th	clay	potatoes	53	67½	95	67½	60½	73½
A. S. McBean	Glengarry	" 8th	dark loam	turnips	84	82	87	80	81	80
James Gray	Peel	" 9th	clay loam	oats	85	80	88	88	71	65
Sleightholm Bros.	"	May 25th	heavy clay	"	79	72	76	60	79	51
A. J. Haist	Haldimand	" 31st	new ground	sod	108	198	79	70	90	94
Thomas Irwin	Middlesex	" 24th	black loam	oats	195	168	118	98	99	70
Richard Stutt	Lambton	" 29th	clay loam	"	74	77	130	102	165	110
E. Wright	Lennox	June 9th	"	hay	105	80	90	80	90	85
A. McCall	Elgin	May 26th	sandy loam	sod	150	120	85	102	78	101

Conclusions.

(1) The individual experiments show that no one variety of corn is equally suited for all parts of Ontario.

(2) The order of the varieties, when placed according to the average yield per acre, also represents their relative standing in their approach to maturity, the Mammoth White Surprise being the latest and the Salzer's North Dakota the earliest variety.

(3) The greatest average yield of green ears was produced by the Wisconsin Earliest White Dent in the co-operative tests, and by the Wisconsin Earliest White Dent and the Mammoth Cuban, in the Farm test for two years.

(4) The Mammoth White Surprise and the Giant Beauty produced the longest average plants, and the Salzer's North Dakota and Thoroughbred White Flint produced the shortest plants.

(5) The Wisconsin Earliest White Dent and the Salzer's North Dakota produced the highest average number of well developed ears, and the Mammoth White Surprise and the Thoroughbred White Flint produced the lowest average number of well developed ears.

VI. TESTING FIVE PROMISING VARIETIES OF TURNIPS.

(1) Five plots, each containing 272 square feet, are required with the experiment with turnips, or mangels, or carrots.
(2) The drills for the roots should be twenty-five inches apart.
(3) Make all plots alike, and arrange each plot according to one of the following plans: *(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.
(4) Sow the different varieties upon their respective plots.
(5) Thin young plants in the rows to the following distances apart: Mangels and turnips, ten inches carrots, four inches.
(6) Be careful of the plants when cultivating and hoeing the ground.

Individual results of nineteen experiments.

Name.	County.	Nature of soil.	Cropping of 1892.	How and when last manured.	Yield of turnips per plot				
					Jersey Navet.	Red Globe Norfolk.	Hartley's Bronze Top.	Carter's Elephant.	White Swede.
					lb.	lb	lb.	lb.	lb.
W. H. Locke	Northum'l'd	Clay	Corn		423	390	242	210	196
Wm. Simpson	Kent	Rich clay loam	Beans	Never	320	280	272	312	250
Robt. Keppy, jr	Parry Sound	Clay loam	Peas	1893	280	280	200	216	200
Robt. B. Fleming	Bruce	Rich loam	Oats	1893	199	237	196	274	103
M. Johnson	Simcoe	Sandy	Spr'g wheat.	b. y. m	263	398	229	103	53
Jno. Grierson	Grey	Clay loam	Oats	Green manure	372	330	199	238	150
Wm. Dinniwell	Bruce	"	Fall wheat.	Hog manure	765	620	770	780	624
G. S. Hull	Middlesex	"	Oats	b. y. m	335	279	238	246	204
Albert Edwards	Russell	Sandy loam	Corn	1893, b. y. m	277	318	378	330	266
G. H. Clare	Hastings	Heavy loam	Potatoes	b. y. m	765	608	692	744	575
M. J. Fisher	Stormont	Light & sandy	Beans	1891, lightly	221	196	130	116	126
Jas. A. Kidd	Simcoe	Clay loam	Barley	1892. 18 l'ds pr acre.	400	270	270	240	207
D. Kiernan	Dufferin	" "	Clover sod	1893	525	385	350	360	260
J. F. Davidson	Peterboro'	Sandy "	Spr'g wheat.	1892, f. y. m	405	459	238	203	193
W. A. Richardson	Durham	Clay "	Barley	1892, top dressed	287	325	242	348	280
Harry E Beemer	Norfolk	Sandy "	Pasture		470	480	450	500	500
Gordon Young	Huron	Rich loam	Fall wheat	1893, 25 l'ds pr acre.	280	200	250	200	110
Robt. Webster	"	Clay "	Potatoes	1893, s. m	125	130	145	150	120
Jas. Nickason	Muskoka	Sandy loam			390	300	240	240	180

Average results of nineteen experiments.

Varieties.	Average of 19 co-operative tests. Yield per acre, 1893.	Average of Experimental Farm tests, 2 years, 1892-3.
	bushels.	bushels.
Jersey Navet	996.7	689.7
Red Globe Norfolk	911.5	604.7
Hartley's Bronze Top	804.3	659.3
Carter's Elephant	801.3	562.5
White Swede	645.1	638.8

The Jersey Navet and the Red Globe Norfolk are both fall turnips, and the Hartley's Bronze Top, Carter's Elephant and White Swede are Swede turnips. The seed of the Jersey Navet was obtained from the United States, that of the Carter's Elephant from England, and that of the other three varieties from Ontario.

Conclusions.

(1) The fall turnips give a greater yield of roots per acre than the Swede varieties in the co operative tests of 1893.

(2) The Hartley's Bronze Top gave the largest yield per acre of the Swede varieties in the co-operative tests of 1893, as well as in those of 1892.

(3) The Jersey Navet gave the largest yield of roots per acre in the co-operative tests for 1893 and in the Farm tests for the past three years.

VII. TESTING FIVE PROMISING VARIETIES OF MANGELS.

INSTRUCTIONS—Same as those given for turnips.

Individual results of eighteen experiments.

Name.	County.	Nature of soil.	Cropping of 1892.	How and when last manured.	Yield of mangels per plot.				
					Steele Bros.' Long Red Selected.	Mammoth Red Intermediate.	Carter's Warden Orange Globe.	White Silesian (sugar beet).	Mammoth Golden Giant.
E. L. Smith	Kent	sandy	new ground	never	572	440	399	450	435
Manley Smith	"	"	"	"	572	459	404	440	425
A. G. McKenzie	Oxford	clay loam	fall wheat	b.y.m., 1893	249	175	161	253	175
R. H. De La Matter	Lincoln	clay	potatoes	b.y.m., 1892	620	490	788	505	497
Jas. A. Kidd	Simcoe	"	barley	"	150	150	122	165	152
Robert Scott	Stormont	"	peas and oats	"	301	249	218	262	162
Wm. Rowand	Bruce	clay loam	potatoes	"	336	303½	235	256	272
Jno. R. Suddaby	Wellington	light loam	hay	"	285	205	253	197	189
Wm. J. Wilson	Dundas	loam	pasture		450	300	380	180	500
D. C. Gardiner	Huron	clay	oats	b.y.m., 1893	360	220	280	160	330
Wm. Simpson	Kent	sandy loam	potatoes	b.y.m., 1892	640	520	320	326	440
Thos. Topping	Frontenac	"	"	"	310	320	312	295	314
Geo. Baird	Huron	clay loam	fall wheat	"	143	126	136	165	138
Jas. Cruickshank	Kent	sand	corn	"	222	234	150	320	180
Joshua Knight	Frontenac	clay	potatoes	"	427	430	357	266	420
Jos. H. Davison	Wellington	clay loam	onions	b.y.m., 1893	326	356½	376	358	267
Forbes Clark	Dufferin	clay	turnips	"	706	558	296	500	129
J. D. Smith	Durham	light sand	potatoes		194	165	116	160	119

Average results of eighteen experiments.

Varieties.	Average of eighteen co-operative tests—Yield per acre, 1893.	Average of Experimental Farm tests—two years, 1892-3.
	bushels.	bushels.
Steele Bros.' Long Red Selected	1016.8	618.8
Mammoth Red Intermediate	844.5	644.2
Carter's Warden Orange Globe	785.6	424.7
White Silesian (Sugar Beet)	778.9	509.2
Mammoth Golden Giant	761.9	368.0

The variety of Sugar Beet is one used mostly for stock-feeding.

CONCLUSIONS.

(1) The Steele Bros.' Mammoth Long Red Mangel gave the highest yield of roots per plot in eight of the co-operative experiments out of ten conducted in Ontario in 1892, and eleven out of eighteen conducted in 1893.

(2) The Vilmorin's Improved White Sugar Beet gave an average yield of 828.9 bushels per acre over Ontario in 1892, and the White Silesian Sugar Beet an average of 778.9 bushels per acre in 1893.

(3) In regard to yield per acre the Sugur Beet holds an intermediate position among the mangels in the co-operative tests in 1892, and also an intermediate position among the mangels in the Farm test for two years.

VIII. TESTING FIVE PROMISING VARIETIES OF CARROTS.

INSTRUCTIONS—Same as those given for turnips.

Individual results of twenty-four experiments.

Name.	County.	Nature of soil.	Cropping of 1892.	How and when last manured.	Yield of carrots per plot.				
					Improved Short White.	Large White Belgian.	Large White Vosges.	Danver's Half Long.	Guerande
					lb.	lb.	lb	lb.	lb.
Peter Rutherford ..	Algoma	clay loam	tomatoes	.....	208	180	220	216	214
A. Dawson	Brant	sandy	carrots	b.y.m., 1892..	202	176	168	154	100
R. H. De La Matter.	Lincoln	clay.....	potatoes.....	" ..	612	500	506	516	510
Jas. A. Kidd	Simcoe	.....	....	.....	258	148	152	195	162
Wm. Quinn	Muskoka ..	sandy loam	potatoes.....	1893.....	134	73	134	94	71
Geo. A. Snyder	Lincoln	black loam	"	never	194	104	132	78	67
Wm. Clark	Muskoka ..	sandy loam	beets	1892.....	167	200	114	190	188
Wm. Ferguson ..	" ..	"	oats	1892.....	320	328	312	192	200
Nicholas DeHart ..	Simcoe	light clay	potatoes	1893	260	263	275	257	213
Daniel Edge	Grey	light loam.....	mangels	b.y.m., 1892..	342	246	266	210	218
W. A. Johnston....	Dufferin.. .	clay loam	barley.....	1893.....	310	296	280	208	190
Wm. J. Phillips....	Algoma	light sandy loam	potatoes	1892.....	525	640	450	490	395
S. M. Peacock	Elgin	sand	corn	1892....	141½	120¾	148¾	110¾	156¾
Robt. Keppy, jr....	Parry Sound	sandy loam	roots	1893...	148	120	104	150	140
D. P. L. Campbell..	Glengarry..	clay loam	oats	1893, f.y.m....	201	230	203	180	234
Jas. Pegg	Grey .	sand loam.....	mangels	1892, b.y.m ..	269	261	372	275	317
Joshua Knight	Frontanac..	clay loam	potatoes	" ..	366	270	368	302	310
Jas. Smith	Bruce	"	peas	1893, b.y.m ..	375	372	362	288	335
David Sinclair.....	Muskoka ..	light sand ..	rape	1892, b.y.m ..	189	131	195	163	177
Alex. Kirk	Perth	.....	potatoes	... .	454	313	320	295	245
Wm. Esson	Muskoka ..	clay loam	"	b.y.m	320	215	192	264	279
Manley Smith... .	Kent	mucky sand	1893, cat tails.	never	240	280	160	220	160
W. H. Smith	Elgin	sand	potatoes	1892, s.m	480	218	360	352	320
Jacob Factley	Welland ...	gravelly loam ..	"	never	304	280	201	520	215

Average results of twenty-four experiments.

Varieties.	Average of twenty-four co-operative tests—Yield per acre, 1893.	Average of Experimental Farm tests—two years, 1892-3.
	bushels.	bushels.
Improved Short White	780.0	1009.7
Large White Belgian	666.1	853.0
Large White Vosges	657.9	958.8
Danver's Half Long Orange	657.9	861.3
Guerande	601.9	740.0

CONCLUSIONS.

(1) The Improved Short White carrot took the lead in point of yield in 50 per cent. of the co-operative experiments during 1892, and in 42 per cent. of the co-operative experiments during 1893.

(2) The white-fleshed varieties of carrots all gave better yields of roots than the yellow-fleshed varieties.

(3) The Guerande was perhaps the easiest removed from the ground of all the varieties tested.

(4) The Improved Short White is an excellent variety of carrots for general cultivation.

IX. TESTING SIX PROMISING VARIETIES OF SPRING WHEAT.

(1) Select a portion of uniform soil and mark off six plots, for either spring wheat, or barley, or oats, and four plots for peas. Each plot should be one rod square. Allow paths three feet wide between the plots Note.—To prevent the peas from hybridizing, the plots should be located at least 100 feet apart.

(2) Drive stakes at the four corners of each plot.

(3) Sow the different varieties upon their respective 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 the plots and cut off any plants that happen to be outside the line.

Individual results of 29 experiments.

Name.	County.	Nature of soil.	Cropping of 1892.	When and how last manured.	Yield of grain per plot.					
					Herison Bearded.	Blue Stem.	Rio Grande.	McCarlin.	Red Fern.	Pringle's Champ'n.
					lb.	lb.	lb.	lb.	lb.	lb.
J. M. Tupper	Grey	clay loam	potatoes		7	6.5	5	6	5.5	6.5
M. Munro	Glengarry	"	turnips	1892, f.y.m.	11.3	13	8	7.5	10.1	9
L. Dillabough	Dundas	gravelly	potatoes	1892	4.5	3	6.3	4.8	6	5
Jno. F. Eaton	Grey	clay loam	fodder corn.	1892, b.y.m.	6	9	5	5	5.5	6.5
Wm. Marjerrison	Glengarry	"	oats	1893	3	3	8	8	2	2
J. I. Graham	Grey	loam			3	4	3	2	6	8
J. K. Campbell	Grey	sandy loam	corn	1892	2.5	2.5	2	1.8	1.8	2.5
Chas. Rankin	Simcoe	clay	fall wheat	1892	4.5	5	3	3	3	3
Hugh Smith	Victoria	clay loam	oats	1892, b.y.m.	5	2	2	2	3	4
No name		gravelly	clover		6	10	10	9	9	8
Geo. E. Johnson	Peterborough	" loam	fall wheat	1891, b.y.m.	1.8	3.5	1.3	5	2.8	2
Alfred Kay	Muskoka	sandy "	barley	1892, b.y.m.	5.3	6	8	4.5	5	3.5
Jno. Stewart	Durham	clay "	wheat	1891	4.5	4.5	6	4	6	4
Jas. Cook	Wellington	heavy clay	peas & oats	1890, b.y.m.	5.3	7.5	4.4	3.9	6.6	4.5
W. S. Scott	Stormont	clay	potatoes	1892	8	9	9	5	5.5	5.5
T. W. Klinck	York	clay loam	barley	1890, b.y.m.	5.2	5.2	4.1	3.7	5.6	3.5
W. H. Clark	Leeds	"	wheat	1893, b.y.m.	2.2	1.6	1.4	2.9	2.3	1.2
Robt. Waterston	Russell	"	oats	1886	5.2	3.3	4.3	5	4	6
C. J. S. Naftel	Huron	sandy loam	spring wheat	1892, b.y.m.	5.3	4	6.2	5	3.6	4.4
P. W Russell	Kent	clay "	corn	1891, b.y.m.	6	4.5	7	7.3	4.8	3
Alex. S. Wier	Muskoka	sand "		1893, b.y.m.	14.5	14.5	13	13	12	14
Isaac W. Reid	Victoria	clay "	peas		6	7	5	3.5	4	3
Geo. Martin	Simcoe	clay "	fall wheat	1891	4.5	4.4	4.6	5.5	4.4	5
J. N. Kernighan	Huron				5	4	4.5	5	4	3.5
Jno. Alton	Victoria	clay loam	potatoes	b.y.m	5	3	5	4	2.5	4
Ed. Wynne	Bruce	clay	fall wheat	never	2	2	2	1.5	1.5	1.5
No name		clay loam	barley	1890, b.y.m.	6	4.5	4	5.5	3.5	5
Louis N. Smith	Norfolk	sandy	carrots	b.y.m	5.9	3.1	5.8	5.9	2.6	3.7
Sid. McKenzie	Ontario	clay	potatoes	1892, b.y.m.	16.5	15	9	15	10	9

Average results of 29 experiments.

Varieties.	Average of 29 co-operative tests—1893.		Average of Experimental Farm tests—2 years, 1892-3.	
	Straw per acre.	Grain per acre.	Straw per acre.	Grain per acre.
	tons.	bush.	tons.	bush.
Herison Bearded	1.2	15.3	2.4	27.4
Blue Stem	1.1	15.3	1.8	25.3
Rio Grande	1 2	14.5	2.0	23.5
McCarlin	1 3	14.1	2.3	22.8
Red Fern	1.4	13.1	2.4	30.8
Pringle's Champion	1 3	12.9	2 2	26 9

The seed of the Herison Bearded variety was imported from France in 1888 and that of the Pringle's Champion from Germany the same year. The seed of the Blue Stem was sent as a gift to this station in the spring of 1892 by the director of the North Dakota Agricultural Experiment Station. The Rio Grande, McCarlin and Red Fern are all Ontario varieties.

CONCLUSIONS.

(1) The Herison Bearded stands at the head of the list in point of yield in the co-operative experiments of 1893, and also in the Farm tests with spring wheat for the past five years.

(2) The first variety to reach maturity was the Herison Bearded and the last was the Blue Stem.

(3) The Red Fern and the Pringle's Champion made a much better yield relatively in the station test for two years than in the co-operative tests for 1893.

(4) The longest average straw in the co operative tests was produced by the Red Fern and the shortest average straw by the Blue Stem.

X. TESTING SIX PROMISING VARIETIES OF BARLEY.

INSTRUCTIONS.—Same as those given for spring wheat.

Individual results of 11 experiments of barley.

Name.	County.	Nature of Soil.	Cropping of 1892.	How and when last manured.	Yield of grain per plot.					
					Mandscheuri.	Oderbrucker.	Hungarian.	Guymalaya.	Kinna Kulla.	Highland Chief.
					lb.	lb.	lb.	lb.	lb.	lb.
A.G. McKenzie	Oxford	clay loam	potatoes	b.y.m., '92.	10.5	7.0	7.5	5.5	5.0	4.5
Chas. Doherty	Peel	black loam	fall wheat	b.y.m., '91.	8.0	8.0	9 0	6 0	7.0	5.5
Jno. Henderson	Hastings	clay loam	potatoes		10.0	6.0	6.0	9 0	3.0	2.0
Thos. Appleby	Huron				4.0	5 0	4 0	2.5	2.5	3.0
David Graham	Hastings	clay loam	wheat	b.y.m., '91.	8.5	10.6	5.5	6 0	9.0	7.3
J. E. Dyer	Durham	clay loam	hay	b.y.m., '90.	1.5	4.0	7.5	4.5	4.5	8.5
Robert Keppy	Parry Sound	sandy loam	oats		6.0	3.0	3.0	4.3	3.0	3.0
Jos. Kinder	Renfrew	light loam	wheat	b.y.m., '93.	6 8	6.2	10.1	9.1	6.0	5.4
John Mortimer	Algoma				8.0	7 0	4.0	3.0	6 0	6.0
John Watson	Ontario	loam	wheat	b.y.m., '91.	5.5	5.0	3.5	4.0	1.0	4.5
Chas. Young	Algoma	sandy loam	hay	never	6.5	6.0	6 0	6 0	7.8	7.3

Average results of 11 experiments.

Varieties.	Average of 11 co-operative tests, 1893.		Average of Experimental Farm tests, 2 years, 1892-3.	
	Straw per acre.	Grain per acre.	Straw per acre.	Grain per acre.
	tons.	bushels.	tons.	bushels.
Mandscheuri	.9	23.7	1.6	53.3
Oderbrucker	.9	20.7	1.5	49.7
Hungarian	.8	20.0	1.4	32.3
Guymalaya	.9	18.0	1.5	33.9
Kinna Kulla	1.0	17.7	2.0	57.1
Highland Chief	.9	17.3	1.3	56.1

The above named varieties of barley were all imported by this station in the spring of 1889. The Mandscheuri came from Russia, the Oderbrucker from Germany, the Hungarian from Hungary, the Guymalaya and the Kinna Kulla from Sweden, and the Highland

Chief from the United States. The Mandscheuri and the Oderbucker are six-rowed varieties; the Hungarian and the Guymalaya, hulless varieties, and the Kinna Kulla and Highland Chief, two-rowed varieties.

Conclusions.

(1) The Mandscheuri variety of barley gave the highest yield of grain per acre in the co-operative tests for both 1892 and 1893.

(2) The six-rowed varieties of barley gave the highest yield per acre in the co-operative tests for 1893; the hulless varieties the next highest yield, and the two-rowed varieties gave the lowest yield per acre.

(3) The Kinna Kulla and the Highland Chief have both done exceedingly well in the station tests for the past two years.

(4) The varieties which ripened first were the Mandscheuri and the Oderbrucker and the varieties which ripened last were the Hungarian and the Kinna Kulla.

(5) The Oderbrucker barley which stood second in the tests of 1892 for yield of grain also stands second in point of yield per acre among the varieties tested in 1893.

XI. TESTING SIX PROMISING VARIETIES OF OATS.

Instructions—Same as those given for spring wheat.

Average results of 105 experiments.

Varieties.	Average of 105 co-operative tests, 1893.		Average of Experimental Farm tests, 2 years, 1892-3.	
	Straw per acre.	Grain per acre.	Straw per acre.	Grain per acre.
	tons.	bushels.	tons.	bushels.
Siberian	1.7	52 4	2.8	75 1
Poland White	1.6	52.0	2.6	67.6
Joanette	1.5	51.0	2.7	82.4
Danebrog	1.6	50.4	2 5	71.7
Bavarian	1.6	49.6	3 0	71.5
Golden Giant	1.6	45.1	2.3	62.4

The Siberian variety was imported from Russia, the Poland White and the Joanette from France, the Danebrog from Germany, and the Bavarian and Golden Giant were obtained in Ontario.

Conclusions.

(1) The Siberian, which stands at the head of the list in average yield of grain per acre of one hundred and five experiments in 1893, also occupied first place in the average of one hundred and twenty-five experiments in 1892.

(2) The Joanette, which stands third in the list of 1893, also occupied third place in the list of 1892.

(3) The Joanette has done exceedingly well on the station plots.

(4) The Golden Giant made a poor record, comparatively, both in the co-operative and the station tests.

(5) There seems to be a greater demand in Ontario for oats than for any other kind spring grain.

XI. TESTING SIX PROMISING VARIETIES OF OATS.—*Continued.*

Individual results of 105 experiments.

Experimenter.	County.	Nature of soil.	Cropping of 1892.	How and when last manured.	Yield of oats per plot. (lb.)					
					Siberian.	Poland White.	Joanette.	Danebrog.	Bavarian.	Golden Giant.
Forbes Clark	Dufferin	clay loam	oats		18.0	21.0	18.0	12.0	18.0	12.0
J. R. Randell	York	sandy loam	potatoes	b.y. m., '92	10.0	8.5	9.0	9.5	10.0	7.5
W. J. Young	Grey	clay loam		" '90	3.5	5.0	2.5	4.0	3.0	4.0
Edward Wynne	Bruce	clay	grass		3.5	3 5	3.0	4.5	4.5	1.0
Robert Sparling	Lambton				2.0	4.0	5.0	3.0	5.0	3.0
W. J. Oke	Huron	clay loam	potatoes	b.y m.	14 5	13.0	19.0	10.0	17.0	11.5
R. H. Mitton					13.5	13.0	13.0	12.0	12.0	10.0
Jas. Laurie	Kent	clay loam	beans	never	8.0	10.0	14.0	9.0	7.5	11.0
Fletcher Davis	Welland	black loam	hay	"	7.0	9.0	10.0	8.5	9.5	9.0
Geo. Glaister	Waterloo	clay loam	oats	b.y. m., '91	24.5	18.0	26.5	17.5	25.0	18.0
A. G. McKenzie	Oxford	"	potatoes	" '92	12.0	10.5	9.0	11.0	10.0	9.0
Henry Rivers	Lambton	"	corn	" '92	25.0	22.0	24 0	15.5	21.0	14.5
Dugald Talmon	Elgin	gravelly loam	potatoes	" '92	8.0	6.5	7.5	9.0	6.0	7.0
Walter Hick	Huron	clay loam	corn	" '92	8.8	7.9	9.6	6.3	7.6	8.0
E. Barrick	Welland	clay	fall wheat	never	10.5	10.5	8.0	9.0	8.5	6.0
Jos. W. Newman	Grenville	sandy loam	corn	b.y. m., '92	15.0	13.0	14.5	13.5	12.0	15.5
Robert C. McNeil	Kent	clay loam	corn	" '89	22.0	29.0	18.0	20.0	21.0	26.0
Peter Grant	Bruce	"	potatoes	" '92	11.5	12.0	10.5	11.0	11.0	10.5
W. J. McLean	Grey	sandy loam	sod		7.5	6.8	7.3	5.0	6.0	4.0
W. H. Caton	Welland	clay loam	bare fallow	f.y. m., '92	8.3	8.0	5.0	6.0	6.0	3.5
W. J. Falconer	Dufferin	"	peas	" '92	14.0	11.0	14.5	12.0	13.5	14.0
James Stitt	Norfolk	sandy loam	turnips	b.y. m., '92	11.0	12.0	13.0	10.3	12.3	12.0
Thos. Mollard	Huron	clay loam	bare fallow	" '92	11.5	10.8	11.0	9.8	9.3	9.5
W. A. Scott	Parry Sound Dis.	sandy loam	hay	" '93	21.0	24.5	18.0	21.0	17.0	19.0
Samuel Brown	Parry Sound Dis.	"	wheat	never	11.8	10.5	9.8	7.5	8.0	12.0
Edward Mans	Brant	"	beans	never	11.0	11.0	9.5	9.5	9.5	6.5
R. McKenzie	Bruce	light loam	oats	never	7.0	8.0	8.5	9.0	10.0	7.5
Isaac E. Groff	Waterloo	sandy loam	carrots	b.y. m., '92	9.0	10.0	9.5	9.0	8.5	6.5
D. H. Dougald	Glengarry	light clay	barley	" '91	22.0	17.0	15.0	22.0	16.0	16.0
J. W. Hunter	Huron	loam	old pasture	never	8.0	6.0	8.5	8.0	7.0	8.5
John Sirr	Parry Sound Dis.	clay loam	"	never	10.5	12.0	15.0	11.0	11.0	10.0
R. M. Vanluven	Frontenac	sandy loam	oats	b.y. m., '93	9.8	7.0	9.0	11.0	8.5	10.0
Jas. Gardiner		sandy	oats	" '93	9.0	7.5	10.0	12.5	12.0	12.0
John Wilson	Halton	light sandy soil	potatoes	" '92	4.8	6.8	5.5	6.3	5.3	6.5
Jas. Johnston	Muskoka	clay loam	peas and oats	never	7.5	9.0	6.0	9.0	8.5	6.0

XI. TESTING SIX PROMISING VARIETIES OF OATS.—*Continued.*

Individual results of 105 experiments.

Experimenter.	County.	Nature of soil.	Cropping of 1892.	How and when last manured.	Yield of oats per plot. (lb.)					
					Sheridan.	Poland White.	Joanette.	Daneborg.	Bavarian.	Golden Giant.
Chas. E. Thompson	Oxford	clay loam	wheat		10.0	10.0	13.0	9.0	9.3	8.5
Jas. W. Grady	Grey	"	turnips	b.y. m., '92	8.3	13.5	12.5	11.0	11.5	11.5
W. Fotheringham	Huron	"	barley	" '87	11.0	11.0	12.0	10.3	8.3	9.3
John F. Andrew	Huron	"	wheat	" '92	10.5	11 0	15.0	7.5	8.5	7.0
Fred. Christensen	Haliburton	light sandy loam	potatoes	never	7.5	5.5	6.5	8.0	9.0	9.0
Isaac L. Laughlin	Middlesex	clay loam	"	b.y. m., '92	15.0	12.5	14.0	15.8	15.8	15.0
Hugh C. Claridge	Peel	"	"	" '92	14.0	12.7	11.7	16.8	12.6	11.6
Robert Templeman	Lanark	"	hay	" '90	26.0	27.0	18.0	24.0	21.0	25.0
W. H. Clark	Leeds	sandy loam	wheat	"	4.4	3.6	3.9	1.6	2.5	4.4
Crawford Scott	Stormont	clay loam	oats	" '89	7.0	6.0	7.0	8 0	8.0	4.0
Wm. Sterritt	Perth	"	hay	" '90	11.0	10.5	9.0	9.5	8.0	8.5
Wm. Emerson	Halton	"	turnips		10.0	8.0	7.5	2.5	6.0	5.0
Lewis Lamb	Bruce	"	hay	b.y. m., '92	14.0	21.0	16.0	16.0	16.0	17.0
Daniel Marshall	Middlesex	light clay loam	peas	" '84	10.0	8.0	8.5	8.0	10.0	5.5
Archie Carmichael	Middlesex	clay loam	mangels	" '93	16.5	16.0	17.5	15.0	12.5	14.0
W. A. Boyce	Peterborough	"	turnips	never	17.0	14.5	16.5	21.0	13.5	16.0
W. Wight	Lambton	black clay loam	hay	f.y. m., '89	4.3	4.5	4.5	5.0	4.0	4.3
J. C. Clark	York	clay loam	barley	b.y. m., '87	10.3	9.6	12.0	8.4	10.9	8.1
James McEwen	Lambton	clay	beans	" '93	9.5	9.3	9.0	9.8	9.3	6.0
Thomas Stephenson	Grey	clay loam	spring wheat	" '91	15.5	12.8	12.3	15.8	13.5	11.0
Wm. Stitzinger	Welland	sandy	potatoes		12.5	8.5	6.5	6 0	8.8	8.0
Francis Collinson	Parry Sound	sandy loam	peas	b.y. m., '93	10.5	10.1	9.8	10.2	11.9	8.6
Alex. Wood	Oxford	clay loam	pasture	f.y.m. and salt, '93	14.0	14.0	13.0	10.5	12.0	10.0
James Cook	Wellington	"	peas and oats	f.y. m., '90	15.5	16.5	14.5	12.9	10.8	11.5
Peter D. Campbell	Lanark	sandy loam	corn	" '92	8.0	10.0	10·0	9.0	9.0	10.0
Neil McLean	Middlesex	clay	oats	" '85	12.3	12.0	10.0	12.0	11.3	9.5
Jas. A. Stewart	Northumberland	clay loam	corn		21.0	16.0	24.0	15.0	15.0	14.0
Jas. Reed	Lambton	clay	oats		22.0	25.5	22.0	22.3	16.0	8.0
Arch. Carmichael	Elgin	black loam	strawberries		5.0	9.0	5.5	7.0	6.0	7.0
P. Hutshins	Grenville	sandy loam	corn	f.y. m., '89	8.0	8.0	6.0	9.0	10.0	8.0
John Steele	Lanark	clay	corn	never	12.0	17.0	12.0	15.5	13.5	9.0
E. R. Lewis	Brant	clay loam	barley	f.y. m., '92	17.0	17.0	17.0	23.0	20.0	17.5
J. H. Macfie	Middlesex	sandy loam	wheat	" '91	8.0	7.3	8.5	5.3	7.0	6.0
Thomas Shanks	Halton	clay loam	pasture	b.y. m., '88	7 5	8.0	7.0	6.5	8.0	5.3
Robert Keppy	Parry Sound	sandy loam	oats	indefinite	2.5	2.0	2.0	2.0	4.0	3.0
Wesley Stephens	York	clay loam	potatoes	f.y. m., '92	10.3	14.0	15.0	10.0	9.0	10.0

Abram Elsworth	Elgin	sandy loam	wheat	b.y m., '91	6.5	3.7	6.5	6.6	4.5	3.6
John Bushy	Russell				3.3	3.0	4.0	3.0	2.8	3.0
W. C. Ruthven	Leeds	sandy loam	oats	b.y. m., '91	12.0	12.0	10.0	9.0	12.0	17.0
Royal Rogers	Ontario	clay loam	turnips	" '92	11.5	12.0	12.0	12.0	11.5	11.0
John McAsh	Huron	"	turnips	" '92	12.3	12.5	11.5	10.5	11.8	11.5
Robert Watson	Grey	sandy loam	wheat	" '91	7.5	8.0	6.5	8.8	9.5	7.0
Thos. S. Henderson	Wentworth	"	peas	" '87	9.5	8.5	11.5	11.5	11.0	9 0
Robert McDonald	Glengarry	"	oats	" '91	14.0	14.0	19.0	18.0	17.0	12.5
J. D. Tinney	Victoria	heavy clay		never	10.0	12.8	11.0	10.0	9 8	11.5
Jos. Armstrong	Middlesex	clay loam	wheat		5.8	3.9	4.0	5.0	4.6	1.6
Wm. Henderson	Wentworth	sandy loam	hay	b.y. m., '88	5.1	5.3	6.4	5.6	4.3	5.1
Henry Robertson	Dundas				8.5	7.0	5.0	9.5	9.0	8.0
John F. Wilson	Oxford	gravelly	peas and oats	b.y m., '93	10.5	8.0	9.0	10.0	9.0	8 0
Thos. Appleby	Huron	gravelly loam	peas	" '93	9.0	10.0	13.0	9.0	10.0	11.0
John E. Roland	Perth	clay loam	oats	never	11.0	14.0	12.0	14.0	12 5	11.0
James Duncan	Huron	clay loam	corn	b.y. m., '92	25.0	27.0	20.0	27.0	26.0	17.0
Geo. Lyall	Simcoe	sandy loam	spring wheat	" '91	3.0	3.5	4 5	5.0	3.0	3.0
Thomas Smith	Simcoe		potatoes		7.8	8.3	2.0	9.0	7.3	5.5
Francis E. Petit	Oxford	clay loam	corn	b.y. m., '89	7.0	9.5	9.0	7.0	8.8	8.0
John Crawford	Kent	"	fall wheat	" '91	14.0	13.5	15.5	15.5	18.5	19.5
Walter Gardiner	Perth	clay	"	b.y. m., '91	3.0	4.0	4.5	3.0	3.5	4.0
Joseph Tuck	Wellington	clay loam	oats	" '87	20.0	21.0	20 0	23.0	20.0	22.0
John Dickin	Halton	"	pasture		6 0	5.5	4.0	5.0	4.3	5.0
W. S. Scott	Oxford	sandy loam	sugar beet	b.y. m., '92	7.0	5.0	6 0	8.0	6.0	4.0
O A. Lawrence	Halton	clay loam	corn	" '91	7.0	8.0	7 9	8 0	7.5	4.5
Wm. Marjerrison	Glengarry	"	oats	" '93	18 0	14.0	13.0	13.5	13.5	13.5
W. J. Fisher	Durham	"	roots	" '92	19.0	20 0	15.0	17.0	16.5	17.5
Wm. Sword	Muskoka	sandy loam	peas	" '92	9.5	9.0	10.0	7.0	7.5	10.0
John Phillips	Huron	"	roots	" '92	9.0	6.0	12.0	7 0	5.0	4.0
Wm. Watson					6.0	12.0	4.0	10.0	10.0	8.0
Peter A. Campbell	Lambton	gravelly loam	corn	b.y. m., '92	12.0	12.0	12.0	15.0	16.0	8.0
Wm. E. Beatie	Lambton	clay loam	mangels		16.0	13.0	13.5	16.8	14.0	14.5
Jas. Burns	Ontario		oats	b.y. m., '89	12.0	9.0	8.0	10.0	9.0	5.0
Thos. A. Millichamp	Simcoe	sandy loam	hay		12.0	9.5	8.0	10.8	12.0	8.5

XII. TESTING FOUR PROMISING VARIETIES OF PEAS.

INSTRUCTIONS.—Same as those given for spring wheat.

Individual results of 73 experiments.

Name.	County.	Nature of soil.	Cropping of 1882.	How and when last manured.	Yield of peas per plot.			
					Prussian Blue.	Tall White Marrowfat.	Canada Cluster.	D'Auvergne
					lb.	lb	lb.	lb.
Wm. McKenzie	Perth	clay loam	pasture		18.0	19.0	16.0	15.0
W. Hamilton	Russell	red clay	potatoes	b.y.m., '92	10 0	7.0	11.0	13.0
John Hall	Grey	clay loam	"	never	13.5	13.0	14.5	11.5
David Gilmour	Grey	heavy clay	peas	"	5.0	5.5	4 0	6.3
Edward Prout	Durham	clay loam	pasture	b.y.m., '92	11.0	8.5	12.5	8.0
R. E. King	Ha'dimand	vegetable clay	hay		7.5	6.3	6.3	6.8
John Alton	Bruce	sandy loam	oats	b.y.m., '89	5.0	9 3	6.3	5.5
Jas. B. Muir	Bruce	clay loam	peas and oats	never	8.0	13.0	11.0	13.0
A. T. Bean	Huron	"	fall wheat	b.y.m., '91	10.0	8.5	8.0	6.0
Robert Russell	Bruce	sandy loam	turnips	" '92	5.0	8.5	8.5	6.0
Wm. H. Baird	Wentworth	"	wheat	" '91	9.6	7.0	9.2	6.1
F. W. Lowin	Nipissing District.	heavy loam	oats	never	20 0	22.0	16 5	20.0
Simon Burns	Lambton	clay	oats	"	12.5	8.0	9.0	9.5
David Krick	Monck	loam	hay	b.y.m., '90	5.0	6.5	4.0	5.0
Wm. McDonald	Algoma District	clay loam	wheat	never	32.0	42.0	43 0	23.0
W. L. Buskin	Grey	light loam	hay	b.y.m., '90	15.0	12.0	10.0	10.0
Jas. D. Rose	Wentworth	clay loam	peas and oats	never	1.5	2.0	2 0	7.0
John W. Salkeld	Huron	sandy loam	hay		6.0	6.5	8.0	7.0
Thomas Gadd	Grey	clay loam	fall wheat	b.y.m., '91	15 0	12.0	13.0	10.0
Benj. Mannen	Brant	"	oats		3.5	4.0	5.5	3.0
Jas. Andrews	Durham	gravel loam		b.y.m., '92	12.0	8.5	11.0	8.0
J. Baxter	Perth	clay loam	turnips	" '92	11.0	14.0	10.0	9.0
Wm. Fotheringham	Huron	"	barley	" '87	9.5	12.5	9.5	6.5
John F. Andrew	Huron	"	wheat	" '92	7.0	10.0	9.0	7.5
H. Jacobs	Muskoka	sandy loam	roots	" '93	11.0	10.0	10.0	8.0
Jas. Bell	Lanark	clay loam	hay	" '87	3 0	5.0	3.5	4.0
M. W. Steacey	Leeds	black clay	"	" '93	13.8	10.5	7.0	13.0
Walter Carlaw	Northumberland	clay	fall wheat	" '85	3.5	10.5	10.0	10.5
Joseph Tinney	Victoria	heavy clay	wheat	" '91	5.5	5.0	2.3	.8
J. B. Aylesworth	Addington	sandy loam	potatoes	" '93	6.5	9.0	8.0	7.0
David Campbell	Huron	"	fall wheat		7.8	6.0	6.8	3.5
Jas. Murison	Elgin	"	potatoes	b.y.m., '92	7.0	6.0	2.0	3.0
Robert Brock	Lambton	clay loam	oats		8.0	5.5	7.0	7.0
Robert Keppy	Parry Sound Dis.	sandy loam	"		5.0	3.0	5 0	4.0
Daniel Quinlan	Simcoe	clay loam	old pasture	b.y.m., '89	16.0	15.0	17.0	13.0
John Priddle	Norfolk				9.5	6.8	4.5	2.5
W. C. Ruthven	Leeds	sandy loam	oats	b.y.m., '91	9.5	6.0	12.0	6.0
C. R. Gies	Waterloo	clay loam	"	" '90	8.8	7.3	6.1	8.3
Isaac K. Turner	Grey				10.0	12.0	11.3	9.5
James Johnston	Dufferin	clay loam	oats	b.y.m. '89	13.0	14.0	10.0	11.0
John Douglass	Bruce		sod		8.5	9.0	7.5	7.8
Wm. Cumberland	Simcoe	clay loam	spring wheat	b.y.m., '92	5.0	5.0	4.0	3.0
D. Graham	Perth	clay loam			13.0	10.0	10.5	10.0
D. Oram	Hastings	"	sod		8.3	14.0	8.3	10.0
Joseph Martineau	Prescott				14.0	15.0	15.0	16.5
H. G. Manley	Bruce	clay loam		b.y.m., '89	7.0	8.0	3.5	5.5
W. J. Beatson	York	"	peas	" '89	2.5	4.5	2.5	.5
Henry Coben	Peterborough	sandy loam	oats	" '93	12.0	10.5	8.0	12.5
Wm. Scott	Simcoe	clay	fall wheat	" '87	6.0	8.0	7.0	4.0
John Tiffan	Huron				6.0	5.5	11.0	8.5
V. Forester	Huron				14.0	10.0	8.0	6.0
Bernard Kelly	Simcoe	clay loam	hay	b.y.m., '85	14.0	11.0	11.8	11.0

XII. TESTING FOUR PROMISING VARIETIES OF PEAS.—*Continued.*

Name.	County.	Nature of soil.	Cropping of 1882.	How and when last manured.	Yield of peas per plot.			
					Prussian Blue.	Tall White Marrowfat.	Canada Cluster.	D'Auvergne
					lb.	lb.	lb.	lb.
Wm. Stewart	Northumberland	clay loam		hen m., '93	20.0	10.5	12.0	12.5
D. J. Bagshaw	Ontario	sandy loam	turnips	b.y.m., '93	5.5	2.0	3.3	4.4
A. J. Quinn	Muskoka District.	"	carrots	" '92	8.0	9.0	8.0	11.0
Thos. Smith	Simcoe		potatoes		7.5	2.0	3.0	4.0
Alex. Mitchell	Wentworth	clay loam	hay		7.0	5.5	7.0	6.5
R. Lawrence	Halton	clay soil	pasture		9.8	8.3	11.0	8.0
Wm. Marjerrison	Glengarry	clay loam	oats	b.y.m., '93	15.0	3.5	13.5	7.0
Robert Gardiner	Huron	"	hay		7.0	5.0	5.0	5.0
Robert Camplin	Grey	"	fall wheat	b.y.m., '91	6.8	6.5	5.8	6.0
John E. Rice	Lanark	sandy loam	pasture	" '87	9.5	8.5	8.5	8.0
W. J. Young	Grey	clay loam		" '90	3.0	3.5	3.0	2.5
Allen Shantz	Waterloo	loam	mangels	" '91	4.5	4.8	3.1	4.0
Nelson Gies	Waterloo	sandy loam	potatoes	" '92	5.0	8.5	9.8	6.5
John Dalgarno	Grey	clay loam	pasture	" '89	13.0	15.0	14.0	15.0
John McAuley	Grenville	gravelly	hay		14.0	11.0	15.0	10.0
Wm. Casselman	Muskoka District.	sandy loam	potatoes	b.y.m., '91	14.0	14.8	14.3	10.0
Daniel Madden	Bruce	clay loam	clover	never	17.5	19.0	15.0	14.3
Edward Wynne	Bruce	clay	spring wheat	"	11.0	6.0	10.0	4.5
Rymal Young	Wentworth	clay loam	pasture		5.0	4.5	6.0	4.5
Richard Connolly	Oxford	"	meadow	b.y.m., '89	10.0	10.0	9.0	9.0
No name		"	"	never	17.5	18.3	16.0	15.0

Average results of 73 experiments.

Varieties.	Average of 73 co-operative tests, 1893.		Experiment farm results, 1893.	
	Straw per acre.	Grain per acre.	Straw per acre.	Grain per acre.
	tons.	bushels.	tons.	bushels.
Prussian Blue	.9	25.9	1.9	39.8
Tall White Marrowfat	.9	25.0	1.5	33.1
Canada Cluster	.8	24.5	1.6	34.8
D'Auvergne	.8	21.8	1.2	27.9

The Prussian Blue, Fall White Marrowfat and Canada Cluster were all obtained in Ontario, and the D'Auvergne was imported from France.

Conclusions.

(1) The Prussian Blue has given the largest average yield of grain per acre in both the co operative and the station tests.

(2) The D'Auvergne has given the lowest average yield of grain per acre in both the co-operative and the station tests.

(3) There is a great demand in Ontario for good varieties of peas.

XIII. TESTING FIVE PROMISING VARIETIES OF WINTER WHEAT.

Instructions.

(1) Select a portion of uniform soil and mark off five plots, each one rod square. Allow a path three feet wide between each two consecutive plots.
(2) Drive stakes at the four corners of each plot.
(3) Sow the different varieties upon their respective 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 happen to be outside the line.

Individual results of 60 experiments, received before August 20th, 1893.

Experimenter.	County.	Nature of soil.	Previous cropping.	Yield of grain per plot.				
				Dawson's Golden Chaff.	American Bronze.	Early Red Clawson.	Bulgarian.	Jones' Winter Fyfe.
				lb.	lb.	lb.	lb.	lb.
Richard Mooney	Essex	sandy loam	fall wheat	14.5	9.5	11.0	14.0	9.5
John McNaughton	Wellington	strong loam	clover	11.0	9.5	14.0	10.5	6.5
Jonathan Austin	Norfolk	sandy loam	potatoes	7.5	5.0	5.0	6.5	5.0
John Dalton	Simcoe	clay loam	spring wheat	14.0	16.0	12 5	15.5	11.0
John Lawson	Huron	light loam	peas & oats	8.0	6.0	6.5	8.0	8.0
David Krick	Lincoln	clay loam	buckwheat	3.0	4.8	4.0	7.0	3.5
John Cragg	Kent	clay loam	oats	3.8	3.6	3.3	4.0	3.0
Benj. McKillican	Lambton	clay	potatoes	15.0	23 0	12.0	20.0	17.0
E. Langford	Middlesex	clay	potatoes	13.0	12.0	12.8	10.5	10.8
Robert Robertson	Durham	gravel loam	potatoes	8.5	9.0	7.0	8.5	8.0
J. G. Docker	Elgin	clay loam	peas & oats	12.5	11.0	7.8	9.0	7.0
T. J. M. Skelly	Simcoe	light loam	fallow	4.0	5.3	4.0	1.8	3.5
James Smith	Lambton			13.0	8.0	11.0	14.0	9.0
J. H. Huffman	Lambton	sandy	fallow	6.5	3.0	6.0	4.5	5.0
John Wakem	Middlesex	sandy	corn	6.3	8.5	7.3	8.0	9.5
Abram Rowand	Bruce	clay loam	fallow	10.0	7.5	14.5	14.0	7.5
Alfred Weekes	Middlesex	clay loam	strawberries	26.5	22.0	8.0	20.0	10.0
James McMohan	Lambton	sandy loam	potatoes	17.5	13.8	17.5	16.3	13 3
A. T. Bean	Huron	clay loam	peas	8.3	6.5	7.3	9.0	8.0
George Doe	Elgin	sandy loam	hay	12.5	10.5	11.5	11.0	12.5
Phillip Frazer	Lambton	clay loam	peas	11.0	9.5	11.5	8.0	12.5
Fred Foyston	Simcoe	sandy	peas	17.8	12.3	19.0	12.3	12.8
Daniel Madden	Bruce	clay loam	peas	14.5	14.0	15.3	14.0	12.0
James Gibson	Huron			9.5	7.8	11.0	7.5	10.5
William Sharpe	Simcoe	clay loam	fallow	8.0	7.0	8.0	7.5	7.5
William Kersey	Peel	clay loam	peas	10.5	6.5	6.0	9.5	8.5
William Wood	Simcoe	clay loam	oats	13.0	10.0	14 0	15.0	9.0
Thomas Mederaft	Elgin	gravel loam	potatoes	16.0	14.0	12.0	13 0	13.0
Charles Robins	Haldimand	sandy loam		14.0	16.0	16 0	12.0	9.0
H. Ball	Norfolk			5.1	4.5	6 3	4.0	5.5
W. Schisler	Welland			5.0	4.1	5.3	3.5	Mediter'n. 6.8
George P. Gould	Huron	heavy clay	oats	13.5	10.8	10 5	11.3	10.8
J. D. Drummond	Middlesex	clay loam	peas	8.0	7.0	7.5	8.5	8.0
V. I. Springsteen	Kent	gravel	beans	13.0	9.3	8.0	9.0	10.0
W. N. Mansley	Grey	blue clay		4.9	4.1	6.5	2.7	4.6
John Malvon	Ontario	loam	peas	11.0	10.0	9.0	9 0	8.0
William McAlister	Elgin	clay loam	sod	15.3	17.5	17.0	13.5	17.0
James D. McKinlay	Kent	clay loam	clover	13.5	10.5	14.0	12.5	14.5
						Jones' Wntr. Fyfe.	Gldn. Drop.	Fultz.
S. D. Robinson	Durham	clay loam	peas	17.0	17.0	16.5	14.5	16.5
Hugh McPhee	Huron	clay loam	fallow	10.5	10.5	10 0	9.0	5.0
C. S. Johnson	Monck	clay loam	peas	8.0	6.9	4 5	7.3	5.5
Andrew Kirk	Middlesex	clay	oats	12.0	12.0	9.5	14.0	12.0
C. W. Taylor	Perth	clay	peas	6.3	7.5	4.8	5.8	5.8
J. W. Clark	Kent	gravel	beans	12.3	11.3	10.3	12.3	11.8

Individual results of 60 experiments, received before August 20th, 1893.—*Concluded.*

Experimenter.	County.	Nature of soil.	Previous cropping.	Yield of grain per plot.				
				Dawson's Golden Chaff	American Bronze.	Jones Winter Fyfe.	Golden Drop	Fultz.
				lb.	lb.	lb.	lb.	lb.
David Smith	Peel	sandy loam	peas	5 0	5.0	8.0	7.0	7.0
W. A. Cowie	Wentworth	gravelly loam.	pasture	16 0	14.0	9.0	12 0	11.0
						Sur-prise.	Ful cast'r.	Red Wndr.
James Stephens	Simcoe	clay loam	fallow	10 0	7.5	9.8	9.5	7.0
Alfred Gray	York	stiff clay	potatoes	4 5	4.0	9.0	4.5	9.0
G. T. Markham	Oxford	light clay	fallow	14.0	10.3	10.3	11.0	10.0
Angus McKinlay	Lambton	clay loam	potatoes	11.0	13.0	7.0	8.0	11.0
Wilson Smith	Norfolk	clay loam	clover	11.5	7.0	9.0	11.5	8.5
William Roland	Perth	clay loam	fallow	13 0	4 0	5.0	5.0	6.0
F. W. Roberts	Lincoln	clay	fallow	8.8	9.0	6.0	6 5	5.3
Duncan MacNarmel	Perth	clay loam	peas	14.0	15 0	13.0	15.0	8.0
Robert Walter	Dundas	gravel	potatoes	15.0	12.0	12.0	10.0	10.3
Adam Scott	Huron		hay	11 0	7.0	6.5	1.3	1.5
Donald McDiarmid	Kent	clay loam	beans	5.0	2.5	1.3	2.0	3.5
Robert Ford	Lambton	clay		19.0	8.0	8.0	15.0	10.0
John McTavish	Huron	clay loam	peas	15 0	9 0	13.0	12.0	11.0
John B. Stone	Northumberland	clay loam	barley	11 0	6.0	6.0	6.5	5.5

Summary Report of Winter Wheat Experiment.

The following report of the winter wheat experiment was sent to the Public Press of Ontario in August 1893 :

In the autumn of 1892, eleven valuable varieties of winter wheat were sent out. These were chosen as the best among sixty-two kinds tested upon the farm plots. They were divided into three sets, with five varieties in each set, two of the same kinds being used in every instance for the sake of comparison. Each applicant had the privilege of choosing the set he desired and one-half pound of each of the five varieties chosen were sent to his address, until the limited supply of some of the kinds became exhausted. The size of the plots used in all cases was one square rod, and paths three feet wide were allowed between the plots. The seed was sown at the rate of one and one-third bushels per acre. Up to the present date one hundred and thirty five experimenters have been heard from. Of this number, sixty favored us with very satisfactory reports of carefully conducted experiments, sixteen forwardrd partial reports, and fifty-nine wrote of failure or unreliable results. The sixty satisfactory reports came from twenty-three counties, eleven of which were east and twelve west of the City of Guelph. The names of the different experimenters and the detailed results of the tests will be presented in the annual report of the Experimental Union for 1893. The greatest advantages arising from these experiments are certainly gleaned by the experimenters themselves, but many very valuable lessons can be obtained by thousands of others who carefully study the results. All the eleven varieties were grown upon the experimental plots at the farm in exact accord with the instructions sent out over Ontario. As two of the same varieties were sent to each experimenter, it is possible to obtain a very reliable comparison of all

the kinds distributed. The yields per acre have been calculated from the amounts grown upon the plots. The following table gives the average amount of straw and of grain per acre of the eleven varieties grown on sixty Ontario farms and at the Experimental Farm at Guelph :

Name of Variety.	Straw per acre (tons.)	Grain per acre (bush. 60 lb.)
1. Dawson's Golden Chaff	1.84	34.9
2. Golden Drop	1.71	34.4
3. Early Red Clawson	1.60	32.6
4. Bulgarian	1.76	31.4
5. American Bronze	1.84	31.3
6. Mediterranean	1.85	30 8
7. Surprise	1.51	30.7
8. Jones' Winter Fife	1.65	30.0
9. Fulcaster	1.50	27.4
10. Fultz	1.92	26.4
11. Red Wonder	1.26	24 9

As great care has been taken to select none but the best reports for the above table, the writer considers this summary of very great value and one well worthy the careful attention of the farmers of Ontario. The yields per acre may be rather higher than would be obtained from larger fields of the same varieties, but it will be remembered that the plots were of similiar size in every instance. The conclusions drawn and the remarks made by many of the experimenters indicate much thought, accuracy and good judgement.

The following facts have been obtained from the average results of the sixty reports under consideration :

(1) The Dawson's Golden Chaff gave a larger yield of grain than any of the other varieties in thirty-five experiments out of sixty.

(2) The Early Red Clawson, Surprise, and Golden Drop gave the largest average amount of grain to every one hundred pounds of straw, and the Fultz and Mediterranean gave the smallest.

(3) The Fultz, Dawson's Golden Chaff, Golden Drop, and Early Red Clawson proved to be the earliest maturing varieties, and the Jones' Winter Fife and the American Bronze the latest.

(4) The Dawson's Golden Chaff, Golden Drop, and Fultz made the best appearance in the spring, and the Mediterranean looked the poorest.

(5) The Bulgarian, Fulcaster, and Red Wonder were the least affected by rust, and the American Bronze, and the Jones' Winter Fife were the most affected.

(6) The Dawson's Golden Chaff, American Bronze, and Golden Drop possessed the greatest strength of straw.

(7) The Mediterranean, Bulgarian, and Fultz possessed the longest straw, and the Surprise and Golden Drop the shortest.

(8) The Golden Drop, Fultz, and Mediterranean possessed the plumpest grain, and the American Bronze, and Jones' Winter Fife the most shrunken.

9 The Dawson's Golden Chaff, American Bronze, and Early Red Clawson varieties seemed to be the most in favor with the experimenters, and the Fultz and Red Wonder the least in favor.

(10) The Counties of Lambton, Huron, Simcoe, Middlesex, Elgin, and Kent furnished 34 out of the sixty best reports received.

(11) The average yield of the eleven varieties of winter wheat tested over Ontario was 25.7 bushels per acre, and the average of the same varieties at the Experimental Farm was 35.2 bushels per acre.

(12) The co-operative experimental work in agriculture seems to be much appreciated by the ex-students of the College and by many other leading farmers throughout Ontario who are actually engaged in the work

None of the winter wheat catalogues yet received from Ontario seedsmen have advertised the Dawson's Golden Chaff. This is a variety claimed to have been originated by Robert Dawson, Paris, Ont., who, along with his neighbors, are growing it quite extensively. There are no varieties of winter wheat kept for sale this season at the Experiment Farm.

Distribution of Seeds. The Experimental Union has furnished sufficient money for the distribution of two thousand packages of winter wheat over Ontario this year. These will supply four hundred experimenters with five varieties each. The following varieties have been chosen and are divided into two sets, as indicated below :

Set 1.	*Set 2.*
Dawson's Golden Chaff.	Dawson's Golden Chaff.
Golden Drop.	Surprise.
Early Red Clawson.	Jones' Winter Fife.
Bulgarian.	Early White Leader.
American Bronze.	Early Genssee Giant.

The seed will be sent out by mail free to all applicants, and the produce of the plots will, of course, be the property of the experimenters ; and, in return, we will hope to receive full reports of carefully conducted tests. The grains will be forwarded in the order in which the applications are received until the limited supply of some of the varieties is exhausted. The "instruction sheets" and "blank forms" necessary for the work will be sent at the time the grains are forwarded. Those who wish to join in the work the coming year may choose either of the sets mentioned above. To make the results of the most value to both the experimenters and the "Union," the five varieties should be sown in every instance.

HOG RAISING.

By Thomas Mason.

Hog raising has of late years become one of the most important sources of revenue to the Ontario farmer, and although important advances have been made in this direction, still much remains to be done. The question is, are we doing as much as we ought to do? I think if we look carefully over the situation that as a nation we have made a grave mistake in not paying greater attention to this branch of industry. We have one of the healthiest climates for swine in the world, hog cholera, with the exception of a few cases, being almost unknown. We produce large crops of wheat, peas, oats and barley, which, when combined, make the finest food for hogs possible, and already our product is known and appreciated in Great Britain. Hon. Thos. Ballantyne states that last year he saw Canadian bacon selling in England at 20 shillings per cwt. over American and equal to the best English. With those great material advantages, what are we doing? Actually not supplying the home demand. We are engaged in the unprofitable work of raising wheat at 50 to 60 cents per bushel, and barley at 30 to 40 cents, and sending these grains to market to compete with the products of the Indian coolie, working for 6 to 8 cents per day, or the Russian peasant at starvation wages, at the same time sending large sums of money out of the country to buy hog products that should have been produced at home at a large profit. Our imports of pork, hams, bacon and lard for the last year, for which I have correct returns, amounted to over 26,000,000 pounds, valued at $1,458,585, while our exports amount to a little over 6,000,000 pounds, valued at $684,409. So you will see that there is room for a very considerable expansion in the production before we overtake our own home demand. Then, if we examine the foreign markets, we find that there is an immense demand for all sorts of hog products. Great Britain imports, according to Board of Trade returns, 488,000,000 pounds of ham and bacon, of which Canada furnishes less than 1½ per cent. There ought to be

room there for an expansion in the Canadian trade. I think that we are likely to have safer, steadier markets in the future than we have had in the past decade. A few years ago there was a great outcry raised against American pork in Europe on account of a few cases of trichinæ, developed, it is said, by the use of American pork. Germany, France, and, in fact, nearly every European country, except Great Britain, passed laws prohibiting the importation of American pork. About two years ago, in consequence of Secretary Rusk's Meat Inspection Act and the diplomacy of Mr. Blaine, these laws were removed, and larger quantities are again being exported to those countries, Germany alone having imported as high as $24,000,000 worth in a single year. This fact, coupled with the great shortage of hogs, has been the cause of the very high prices the last two years. There has been a decided change in the style of hog wanted in the last few years. The very fat, heavy hog is not in demand. A long hog, giving plenty of lean meat of a large percentage of bacon, and weighing from 160 to 220 pounds, live weight, is what the leading packers want. This change I regard as directly in the interest of the farmer, as it is much more profitable to sell at those weights than to make them heavy. It has been demonstrated time and again by different experiments that the older a hog gets the more it costs to produce a pound of gain. From my own experience, I think it costs twice as much to make a pound of flesh at nine months of age than it does at four months; consequently I have decided not to keep any hogs longer than six months and sometimes not that long. My first load last summer went at four months and seventeen days, and weighed 150 pounds, live weight; the second load, a week later, 166 pounds; third, a week later, 180 pounds, and the last load, 187 pounds. The average birth date was April 5th. They were from large, vigorous sows and a mature boar. The sows were moderately fed all winter on a little grain, some sugar beets and carrots, with some slop. About two weeks before farrowing, they were separated and fed on a sloppy food of shorts, bran and a little ground grain. They were given a good bed, and when the pigs came were closely watched so that none were killed at first. We managed to save 39 pigs from four sows. They were fed lightly at first, and the food increased as the needs of the pigs demanded it. They had a good clover pasture and plenty of water and shade, and a little salt in their food. Their food consisted at first of skim and buttermilk and wheat shorts. They were weaned at six weeks old; after a couple of weeks a little corn and pea-meal was added; at three months the corn was increased, as soon as the wheat was threshed. About August 1st we commenced feeding ground wheat mixed with shorts until finished. They were fed three times a day all they would eat up clean. After lying down two or three hours they would get up and eat clover. The following is a statement of the cost of the transaction:

Shorts fed to young pigs	$ 40 00
Corn " "	25 00
Wheat " "	66 00
Keep of sows in winter up to weaning	48 00
Skim-milk, buttermilk and pasture	25 00
	$204 00
Less little pigs sold at weaning	15 00
Net cost	$189 00

This would make the cost of raising that 6,000 pounds of pork $3.15 per 100 pounds.

I do not think that we can feed young pigs in large numbers nearly as cheaply in pens as we can on pasture. The orchard, if seeded down, makes a capital run for pigs. I have five fields within easy reach of the house, and as each field in rotation comes into grass I intend to pasture them with hogs, and take the milk and stuff out to them in a large milk can set on a wheelbarrow. The fall litters of pigs cost generally about 1 cent per pound more, live weight, than the spring litters, but often bring that much more in the market. I like them to come in the latter part of August or early in September, so

as to have them large and strong when winter sets in. A good, dry, warm pen is needed and a good yard for exercise. I am a strong believer in exercise for animals, especially young animals that are being fed high. Good supplies of wood ashes and salt are essential to pigs in confinement. A few sugar beets or carrots and parsnips daily are an advantage. One very essential point is never to over feed; always have them clean the troughs at once A dry bed is also essential. To summarize:

Strong, vigorous parentage; a liberal supply of the best food available; a good clover or grass pasture in summer; careful feeding, never surfeiting; a careful attention to details, and marketing at 150 to 200 pounds, are the most important points on hog raising.

Exports—Bacon, 1892.....	11,544,295 lb.,	worth	$1,094,205
" Hams, "	598,083	"	57,801
Imports—Hams and bacon	1,016,367	"	94,846
" Pork	9,819,087	"	504,349

F. J. SLEIGHTHOLM: You say that fall pigs cost one cent more per pound than spring pigs. Will you explain the reason?

Mr. MASON: In the first place you have not the pasture nor the same mild, warm weather. They do much better on pasture in the summer than when they are confined in pens in the cold weather in the winter. I claim that they will make a pound of gain much easier when on pasture than they will in winter, but I cannot state positively how much more.

R. F. HOLTERMANN: I was told by some men from the other side that the reason that pork was so high was because there was so much hog cholera in the United States that they were not able to raise the pigs.

Mr. MASON: Within a few miles of where I live, we have had a few cases of hog cholera. We do not know where the infection came from unless it was from the hogs going through on the trains from the west.

Mr. KEIL: I agree with Mr Mason in regard to feeding hogs in winter, especially young pigs. They will not stand the cold weather; and I do not care how warm you have the pens, there is still something lacking. When they run out on pasture, they will gain fully one-third faster, in my experience.

F. J. SLEIGHTHOLM: I cannot agree with the gentleman that there is so much difference. The cost of raising pigs in winter does not exceed one-third of a cent per pound more than for our best summer-fed hogs. We do not find difficulty in winter, even with young pigs. We have been able to raise them very satisfactorily, and I think at fairly good weights in winter time just as well as in summer. Certainly it does cost a little more to raise them. The weight from appearance in winter-fed pigs far exceeds the summer fed ones.

THE FEEDING VALUE OF STOCK FOODS.

BY PROF. T. F. HUNT, COLUMBUS, OHIO.

I feel greatly complimented at having an invitation to appear before an audience in our sister country, whose kindred ties, as well as geographical position, should bind us into the closest social and commercial relations. I feel complimented, I repeat, when I remember I am to talk upon a subject before an audience whose countrymen have always stood in the front rank. Canadian cattle and Canadian feeding have always been the pride and envy of American stockmen.

Being myself an alumnus of an agricultural college of an American university, it gives me great pleasure to appear before an association composed largely of agricultural alumni, believing most firmly, as I do, that the success not only of American agriculture, but of American institutions, depends largely upon the number, success and influence of the agricultural alumni of America.

The favorite subject for an oration by the college student, and the favorite catch word for the vendor of nostrums, is "Know thyself." This expresses a great truth. We should know the things with which we deal. If we till the soil we should know the soil and the plants that we wish to grow upon the soil. If we make butter we should know the milk and the butter. If we would instruct students, we must not only know the subject we teach, but we must also know the students we seek, though ofttimes fail, to instruct. If we would feed animals of whatsoever kind, we should know the animals, the feed we seek to nourish them with, and the relations of the animal to the food and the food to the animal. This then is my subject. What is the animal? What is the food? And what are the relations of one to the other? Of these things we know little. But we know something.

Let us look first at the animal. If we kill an ox, take off its hide, its feet and its head, and take out its organs of respiration, digestion and generation, we have left a mass of bones, muscle and fat, known as the carcass. This carcass may vary from forty to seventy per cent. of the live weight of the ox, and in a few cases has been known to exceed this latter amount. At the great Fat Stock Show held at Chicago for fifteen years past, the carcass has averaged two-thirds of the live weight. This carcass consists of bones, muscles and fat. The carcass of a fairly good ox will contain about seven pounds of bones, eighteen pounds of fat and thirty-five pounds of muscle and tendons from each hundred pounds of live weight. The quantity and relationship of these parts, together with their quality, is what gives the animal its value as butchers' meat. It is what makes one animal sell for three cents a pound and another sell for six cents a pound.

We seek to produce an animal with as small a quantity of bone as is consistent with health and strength, and as large an amount of fat and muscle as possible. We want neither an excess nor a deficiency of fat. If an excess, it is distasteful, while if there is a deficiency the meat is likely to be tasteless and stringy. The more intimately the fat is mixed with the muscle, the more perfectly it is marbled, the better the quality of the meat. It is not mere fiction that the foot-ball man or the prize-fighter toughens his muscles by exercise. Exercise toughens meat, hence that portion of the muscle of the animal which gets the least exercise, such as the loin, is the most tender, while the leg or the round is tougher. The muscles of the neck, which are constantly exercised in maintaining the head, are naturally tough. To get unexercised muscle, nicely embedded in fat, is the aim of him who feeds for beef, mutton and pork. Looking at the animal from the standpoint of the butcher, helps us to realize the object we are seeking to obtain, and it is often half the battle to know what we are fighting for, but it does not help us much with regard to the methods of attaining our object.

We must look at the more minute structure. We can understand this best by comparing the animal with the food that the animal eats. All plants contain ten primitive substances known as chemical elements. These are: carbon, hydrogen, oxygen, nitrogen, sulphur, potassium, phosphorus, calcium, magnesium and iron. Animals require in addition, sodium and chlorine.

Common salt is composed of sodium and chlorine. No plant could grow without the ten elements mentioned, and no animal could grow without these ten elements and the addition of sodium and chlorine, hence the need of salt for all animals, including man, and the need of a regular supply. Undoubtedly plants do contain small quantities of the elements composing salt, but they are usually deficient as they are not necessary to plant growth. Besides being required for the building up of tissue in the animal body, salt has the property of increasing the activity of the secretive organs of the body. Salt has an awakening power as it were; it makes the animal live fast. A fast life in the ox intended for the shambles or in the dairy animal is as objectionable as the fast young man. It is not profitable for us for the steer to sow his wild oats while being prepared for the butcher, hence while salt should be fed in abundance and with regularity, it should not be fed in excess. It is a very common practice for showmen to feed their cattle a little sulphur. Sulphur is not only one of the substances needed in all muscular tissue, but it is a fact, as shown by analysis, that the hair contains more sulphur than any other part of the body. Hence if there is any deficiency of sulphur in the food, the hair cannot be in as good condition as it should be, and the animal will look unthrifty.

As is well known, bones are largely composed of lime and phosphoric acid. Animals fed on a variety of foods generally get a sufficient quantity of these substances, for while the grains contain an excess of phosphoric acid and a deficiency of lime, coarse fodders usually contain an excess of lime and a deficiency of phosphoric acid. When we feed animals on coarse fodders only, there may be bone hunger, while when we feed hogs on corn alone there may be a deficiency of lime, and weak bones.

The chemical elements which we have just been discussing, cannot sustain life if fed separately. Charcoal, saltpetre, flowers of sulphur, powdered iron, ground bone and common salt mixed up with water, does not constitute animal food. These substances must first be organized into vegetable substances. This is the function of plants. Plants construct the ten elements mentioned, into certain compounds called nutrients, and the reason for an animal eating a food is that these nutrients, if digested, sustain life and growth. The relation between these compounds in the vegetables and in the animals is best understood by comparing two characteristically American products, the hog and the corn that made the hog.

NUTRIENTS IN 100 POUNDS.

——	Corn.	Fat hog.
Water	11	44
Ash	1.5	2
Albuminoids	10.5	12
Fibre	2	None.
Starch, etc.	69.5	None.
Fat	5.5	42

This is probably not quite a fair comparison, because we do not feed corn exclusively except to fattening swine, and the increase of a fattening hog is somewhat different in composition than is that of the whole animal, inasmuch as during the fattening period the animal puts on a relatively much larger amount of fat and a less amount of muscle than it did during its earlier period of growth. Five hundred pounds of shelled corn will on an average produce one hundred pounds of increase in a fattening hog.

The following table shows the pounds of the different nutrients in corn necessary to feed, in order to get one hundred pounds of increase, and also the number of pounds of the different nutrients in this one hundred pounds of increase.

——	500 pounds of corn contains:	And forms 100 pounds increase in a fattening hog, as follows:
Water	55	22
Ash	7.5	0.06
Albuminoids	52.5	6.44
Fibre *	10	None.
Starch, etc. *	347.5	None.
Fat	27.5	71.5

* Carbo-hydrates.

From this table it will be seen that in five hundred pounds of corn, there are something over three hundred and fifty pounds of carbo-hydrates, mostly starch, of which there is practically none in the animal body. This is a fundamental difference between plants and animals. One is composed principally of carbo-hydrates and the other has none. Why does the animal consume such large quantities of carbo-hydrate? All the activities of the animal organism are manifested by the production of heat. This heat is the result of the burning of the carbon in the animal body, just as the burning of coal in the boiler of an engine produces heat through the combustion of the carbon in the coal. The more a man works, the more active a man is, the more he gets up steam, the more carbon is burned in the body. The carbo-hydrates are the principal source of this heat, although the fat and protein is also a source of heat and power. The function of fat and carbo-hydrates is practically identical. There is this difference, however: A pound of fat when digested, will produce about two and one quarter times as much heat or force as a pound of carbo-hydrates. The fat of foods may be laid up in the animal body with very little change. Albuminoids and carbo-hydrates may also be changed into fat. We have seen that practically our ultimate aim in the feeding of an animal for the shambles is the production of albuminoids and fat. The fat of the organic substance which we feed may produce heat, force and fat, but only albuminoids will produce albuminoids, that is, muscle in the animal. A dog will live upon lean meat, but will speedily die if fed only upon fat.

The following table will help us to understand the relation of these proximate substances to animal growth.

CHEMICAL ELEMENTS IN THE NUTRIENTS OF VEGETABLE FOODS.

Nutrients.	Chemical elements.					
Water	Oxygen.	Hydrogen.				
Ash	Potassium.	Phosphorus.	Calcium.	Magnesium.	Iron.	
Albuminoids	Carbon.	Hydrogen.	Oxygen.	Nitrogen.	Sulphur.	
Fibre	Carbon.	Hydrogen.	Oxygen.			
Starch, etc.	Carbon.	Hydrogen.	Oxygen.			
Fat	Carbon.	Hydrogen.	Oxygen.			

A little study of this table will show that an animal cannot live upon starch, fibre or fat, because they do not contain nitrogen and sulphur, which are necessary for the production of muscle. But if an animal has plenty of water, ash and albuminoids, it may live without starch, fibre, or fat, because the albuminoids contain carbon, hydrogen and oxygen. In our subsequent discussion in this paper we will not concern ourselves with the ash, for in ordinary feeding, with the exception already pointed out, the animals get a great abundance of ash constituents. The adult animal is half water, and this important substance should be abundantly supplied in a pure form from pail or trough, but except as far as it affects the mastication and palatability of foods it need not concern us, with two exceptions. First, we should be careful not to feed substances that have so much water that the animal must consume more water than it needs in order to get the necessary food. This is often the case with sheep fed largely upon roots. Second, we should remember that the amount of dry substance is inversely proportional to the amount of water it contains. There may be as much dry substance, and therefore as much food value, in 10 pounds of corn fodder as in 30 pounds of ensilage. When we begin feeding ripe ear corn in the fall, it often takes 100 pounds of ears to make a bushel of dry shelled corn. The next spring 71 pounds of this same corn will make a bushel. It may take several roasting ears to satisfy the appetite of a hungry man, but a small portion of a ripened ear made into Johnny cake will make a substantial meal.

What constitutes the differences in the foods which we feed? We have seen that all vegetable foods contain the same chemical elements and the same nutrients. Wheat and straw, corn and corn fodder, oats and shoe pegs, all contain exactly the same nutrients. Why, then, are some of the substances so much more valuable for food than others? The value of all substances as food, whether for man or other animals, depends primarily upon three things. First, the composition; second, the digestion; and third, the palatability. The differences between oats and shoe pegs are, first, that the oats contain more albuminoids, starch and fat, and less fibre; second, that a much larger proportion of them are digested; and third, that animals like them better.

The palatability of a food is often of more importance than it may at first seem. The better an animal likes a food, the more he will eat. The more the animal eats, the more he is likely to gain in flesh, or she to give milk. It takes a certain amount of food to keep the animal organism going. It has been determined that to maintain an ox weighing 1,000 pounds, without either losing or gaining in flesh, will take 17½ pounds of dry food per day. It is only when an animal of this weight eats more than 17½ pounds of dry food per day that he makes any gain. And why should the turkey intended for Thanksgiving dinner, or the ox intended for Christmas beef, eat more than enough to maintain the animal organism? They will both be as comfortable, and probably live much longer, if they do not eat and grow fat. The lean man enjoys life just as well, and often much better, than the fat man. If we wish him to grow fat we must furnish him some inducement in the way of something he likes to eat; we must tickle his palate.

I once conducted an experiment in feeding pigs shelled corn and corn meal, giving each lot of hogs all they would eat. It was found that the hogs that were fed shelled corn would eat more than those fed on corn meal, and, of course, for reasons just given, made a greater gain for the amount of food eaten. In the same way it has been found, in general, that hogs fed on cooked food will not eat as much as when fed on raw food, and they do not make as good gain for the amount of food eaten. Hence it does not pay in general to cook feed for hogs, if you get it done for nothing.

The only value as food that I have been able to discover in ensilage over corn fodder is that it is more palatable. The difference in composition between ensilage is not very great, and for the most part is in favor of the corn fodder. Experiments have shown that the digestibility of the two are practically the same. In feeding experiments, a pound of dry matter in one has been found to produce about the same gain as the other. In an experiment which I conducted in feeding Shorthorn heifers, there was found a slight advantage in favor of the corn fodder. This I attributed, in part, to the fact that the animal fed ensilage consumed daily all told about 7 pounds of water more than those which were fed the corn fodder. As they did not gain any more than those which had corn fodder, 7 pounds more water had to be eliminated from the system, which required a portion of the food eaten to accomplish. If you feed milch cows 30 pounds of ensilage, with 5 pounds of grain and 4 or 5 pounds of clover hay, they will generally eat all the ensilage up clean, but if you feed the same amount of dry matter in corn fodder, these same cows will leave from ⅛ to ¼ of the corn fodder fed. The advantage, then, of ensilage over corn fodder is that the cattle like it better. When you feed corn fodder, part of it goes to waste; when you feed ensilage it is all eaten.

The reason for feeding a variety of foods is that the cattle like it better, and hence will eat more. Bread and milk is a perfect food, but we would soon get tired of it if fed exclusively upon it. In this careful adjustment of the food to the needs and appetite of the animal consists the art of the feeder.

No mere knowledge of the value of foods can replace the art of the feeder. We have our doctors who are eminent in the treatment of diseases; we would not think of getting along without them, but in many cases the skill of the physician would avail nothing had we not had the hand of the all-seeing nurse to administer the medicine, be she wife, mother or trained servant. So in a proper system of feeding, nursing is often half the battle.

Apart from the palatability of the food, its value as before stated depends upon its composition and its digestibility. It depends upon the relative proportion of the various nutrients and upon the amount of these that is absorbed into the system.

Let us compare a few well-known feeding substances:

Pounds of Nutrients in a Ton.

——	Corn.	Corn fodder.	Corn stover.	Timothy.	Clover.
Water	446	644	644	474	551
Ash	27	70	81	100	120
Albuminoids	184	115	75	100	228
Fibre	36	271	434	512	389
Starch, etc	1,212	858	719	751	609
Fat	75	42	27	63	103
Total dry matter	1,554	1,356	1,356	1,526	1,449

A comparison of this table shows that corn contains more albuminoids, starch and fat than the stover, while the stover contains more fibre, many times over. The great coarse growing corn stalk compares favorably with timothy hay. And when we compare timothy hay with corn fodder (by corn fodder is meant the stover with the corn left in) we find that so far as the composition is concerned, it is in every way superior to timothy hay except in fat. Experiments on the digestibility of these two substances go to show that the corn fodder is the more digestible. That such a coarse product as corn fodder should be as good chemically, or perhaps better, and should be more digestible than timothy, may at first surprise us, but we must remember that appearances are often deceiving. Turnips and pumpkins contain more water than does fresh milk.

Here again the palatability comes in. In an experiment at the Pennsylvania Experiment Station, conducted under my direction, it was found that the feeding value of a pound of corn fodder for the production of milk was somewhat greater than that of timothy, but owing to the fact that all the timothy was eaten and a portion of the fodder was not, the value of the corn fodder was $7.30 per ton when timothy was worth $10 per ton.

The relation of the composition and the digestibility may be illustrated by comparing oats with clover hay for horses:

Nutrients in a Ton.

——	Oats.		Clover hay.	
	Fed.	Digested.	Fed.	Digested.
Ash	68	.....	166	.....
Albuminoids	264	230	312	172
*Fibre	216	56	550	242
*Starch, etc	1,340	1,032	860	593
Fat	112	87	112	63
		1,405		1,070

*Carbo-hydrates.

Oats and clover hay are somewhat alike in that they contain about the same amount of albuminoids and the same amount of fat. The carboh-ydrates are not much unlike, except that in the clover much more of it is fibre and less of it starchy substance. When we come to feed these substances to a horse, we find striking differences, because of the greater digestibility by horses of oats. In the oats, a horse would digest 1,405 pounds in a ton, while only 1,070 pounds of the clover hay would be digested, assuming the digestion experiments which have been made to be correct.

Assuming that a horse requires daily 15 pounds of digestible substance, he could get it by eating 21 pounds of oats or by oating 28 pounds of clover hay. The oats thrown into a feed box would occupy about $\frac{2}{3}$ of a bushel, while, if the clover hay was packed as tightly as it is in a hay mow, it would more than fill five bushel baskets. The mere physical exertion of getting outside 28 pounds of clover would be considerable. This does not prove that clover hay is not a good food for horses. Indeed, it is a good food for horses when in good condition and fed in moderation. We must not follow the work of the chemist blindly. If we do so, we do it at our own peril, and it is a financial peril.

We have seen that animals are composed of bones, muscle and fat, and that to supply this fat and muscle we must feed a certain amount of albuminoids, from which only muscle can be produced, Nothing can produce muscle in animals but the albuminoids. About one-third of the solids of milk is albuminoids. We cannot produce these albuminoids in the milk unless we feed albuminoids in the food. We feed milch cows on clover hay and mill feed because they contain relatively large amounts of albuminoids, and this nutrient is required in large quantities in the production of milk. Young, growing animals put on more muscle in proportion to fat than do fattening animals, and hence require more albuminoids than do the fattening animals. If we feed a food with too small a proportion of albuminoids the animal has to eat more starch and fat than he needs in order to get enough albuminoids; hence there is a waste of starch. For example, suppose that a milch cow weighing 1,000 pounds requires 2 pounds of albuminoids and 12 pounds of carbohydrates, including fat. If we feed her a ration containing only 1 pound of digestible albuminoids and 12 pounds of digestible carbohydrates, the cow would have to eat twice as much carbohydrates to obtain the necessary albuminoids, which would be a clear waste of 12 pounds of carbohydrates that might be avoided by feeding 1 pound of albuminoids. It may be possible, therefore, to save several pounds of corn-meal by feeding one of linseed-meal.

Mature fattening cattle require less albuminoids than any other class. A fattening animal puts on about ten pounds of fat for each pound of muscle, if we do not take into account the water, while in the milk about one-third is albuminoids. Yet, even with fattening cattle, we may give too carbonaceous a food. A feeding test recently conducted at the Maryland Experiment Station illustrates this point. Eight grade Shorthorn steers from the Ohio Western Reserve, weighing about 1,000 pounds apiece, were divided into two lots. Lot one was fed ration consisting of corn and cob-meal 15 parts, cotton-seed meal 4 parts, bran 2 parts, with 5 pounds turnips, half pint molasses, and corn fodder as much as they would eat. Lot 2 was fed as lot 1, except they were not given cotton-seed meal nor bran.

NINETY DAY TESTS WITH EIGHT STEERS.

——	Lot 1, Well balanced ration, Corn meal, cotton seed and bran.	Lot 2, Poorly balanced ration. Corn meal.
Daily gain	2 78 lb.	1.70 lb.
First cost of steers	$154 21	$153 66
Cost of food	70 64	52 57
Total cost	$224 85	$206 23
Amount received on selling	264 24	217 37
Profit	$39 39	$11 14

The steers fed a well balanced ration, ate more food, and not only made more gain, but made more gain in proportion to food consumed. "It was noticeable throughout the test that the steers receiving the well balanced ration were always ready for their feed, eating it with great apparent relish, and it was an unusual occurrence for any of them to leave any unconsumed, while the lot fed on the plain diet had to be constantly watched for fear of overfeeding them."

It is just as essential that we should not feed too much albuminoids as that we should feed sufficient. Fat and carbohydrates are relatively cheaper than albuminoids in most cases and are more easily digested. Albuminoids are relatively expensive for the most part, are difficult to digest, and when fed in larger quantities than are needed, involve extra work upon the system.

In most stock feeding there is not much danger of feeding to large a proportion of the albuminoids. The mistake is frequently made in calf-feeding. Fresh milk is a perfect food for the infant while quite young. Fresh milk is characterized by containing a relatively large proportion of albuminoids, and also by containing a large quantity of easily digestible fat. While milk serves as a balanced food only during the early period of life, just as soon as the calf begins to eat, it begins to increase the proportion of carbohydrates and albuminoids, because it eats more carbohydrates. We know from experience that an excellent food to begin feeding calves is shelled corn.

You will see from the following table that just as soon as the calf begins to eat, he increases the proportion of carbo-hydrates to albuminoids.

NUMBER OF POUNDS OF DIGESTIBLE NON-NITROGENOUS SUBSTANCES TO EACH POUND OF ALBUMINOIDS.

Whole milk	3.3
Skim milk	1.7
Linseed meal	1.9
Pasture grass	5.6
Corn	9.0
Timothy hay	12.0

Milk is not a balanced food for infants or adults. If fed exclusively upon it, persons become nauseated. Bread and milk may be a balanced food, because the bread makes it more carbonaceous. Meat is not a balanced food. It has too large a proportion of albuminoids. Potatoes are not a balanced food. They are carbonaceous. Meat and potatoes may be a balanced food.

You will see from this that skim-milk is far from balanced food. When we change a calf from fresh milk to skim-milk we are changing the diet in the wrong direction. Our success with the skim-milk depends upon how much the calf eats of more carbonaceous foods. If we feed a moderate amount of skim-milk and the calf is eating well of hay, corn and oats, he may be able to balance his diet. On the other hand, if you feed the calf a large amount of skim-milk before it has learned to eat much, the result is likely to be—well you have seen hundreds of such calves, and I will not attempt to describe them.

The following experiment conducted under my direction at the Pennsylvania Experiment Station, illustrates this point: Nine calves from four to ten weeks in age were divided into three lots of three each. The calves in lot 1 were fed 10 lb. of whole milk (2 gals.) each day. The calves in lot 2 were fed 16 lb. of skim-milk, to which was added a porridge consisting of steam cooked fine linseed meal, stirred up in four pounds of hot water. The calves in lot 3 were given 17 lb. (2 gals.) of skim-milk daily. Each of the calves had all the shelled corn, oats and hay it would eat. A summary of the results is given below:

	Lot 1 whole milk.	Lot 2 skim-milk and linseed meal	Lot 3 skim-milk.
Daily gain per animal, lb	1.77	1.11	1.5
Dry substances eaten daily, per animal	4.4	5.4	4.9
Dry substance required to produce a lb. increase	2.5	4.9	3.6
Cost of food required to produce a lb increase	9.9c	4.7c	3.4c

The whole milk was valued at one dollar and the skim-milk at 12½ cents per hundred lb. It is evident from this table that when linseed meal was added to the milk, the calves gained less and ate more food than in the skim-milk. It is also shown that it took much less food to make a pound of increase when we fed a large proportion of easily digestible fat than where we fed a large proportion of albuminoids difficult to digest as was the case when we fed linseed meal. Of course we cannot afford to feed butter-fat worth 25 to 35 cents per pound, but we should seek to supply the fat in some cheap form. It is necessary to distinguish between linseed meal such as you ordinarily buy and such as we used, and ground flaxseed. Linseed meal is the flaxseed after most all the fat has been extracted, and hence by adding to it skim-milk, you are only making a bad matter worse. If you could get ground linseed which is over one-third fat it would be a good substance to add to skim-milk to feed to calves.

Theoretically it is not difficult to construct a fairly well balanced ration. Practically, however, financial considerations make it extremely difficult, often impossible.

Knowing what it is desirable to accomplish, we can often do much by good management. Calves during the first six months of their lives require in addition to the milk, carbonaceous foods. These are easily supplied in the winter. During the next six months, after the milk is omitted, they need an easily digestible, muscle-forming food. There is nothing better than grass. During the first six months of life the calf does not need the grass. During the second six months they should have something more nitrogenous—straw, hay, corn fodder or corn. A fall calf is much more easily supplied with the proper diet than is a spring calf.

Feeders frequently fail to help themselves financially through thoughtlessness. At an Institute last winter I questioned an intelligent and successful dairy farmer about his method of feeding his dairy cows. He stated he was feeding corn and oats largely with what little mill feed came from the wheat ground for domestic purposes. He confessed that he ought to feed more mill feed, but that he could not afford it. At the very moment he was speaking his oats were worth $20 a ton while he could buy middlings at about $14 a ton. There is no better grain food grown for horses than oats, but it is relatively an expensive food. During the past decade oats in the United States have averaged 97 cents per hundred pounds, corn 70 cents a hundred, and mill-feed about 70 cents a hundred. By combining corn and cob meal with wheat, bran or middlings, half and half, we can obtain a food approximately in chemical composition that of oats and costing about 25 cents per hundred pounds less. We have fed at the Ohio State University farm, ten head of horses on such a diet as this, for 15 months, with the best of success, thus saving about one fourth in the cost of the grain food.

Success in feeding is dependent upon many factors, only a very few of which I have briefly touched upon in this long paper. But in closing, I wish to call attention to one other factor. The farmer, the stockman, the stock feeder, all persons engaged in agriculture, stand sharply defined from both the other great industries of life—those of manufacturing and transportation—in that those engaged in agriculture are dealing with living things. When we know all about life and not till then, can we expect to reach perfection in the science and art of cattle feeding. When we reflect with regard to the little we do know, does it not give us hope of the possibilities of great advancement through study and experiment in the future?

Prof. SHUTTLEWORTH: To my mind it seemed real interesting to trace with Mr. Hunt the composition and digestibility of foods and the relation of the food to the animal body. It seemd so to all those who have studied it, but the greatest difficulty for the farmer is to apply it in practice. It seems to me that the great question to consider is probably that one point, how can the farmer apply this theory in practice on the farm. Should measurements and weights be exactly observed in accordance with the science of cattle feeding, or should certain observations guide the practical feeder? Should the appearance be the chief guide to the feeder, or should he rigidly follow the rule of measuring and weighing? Another point in reference to water. The animals, of course, require water, but should the water given be given largely through the food or be given directly as water. I have noticed where an animal is fed roots, there is a great decrease in the amount of

water that it drinks ; it decreases it ever so much more than the total amount of water in the turnips. It seems to me that that is an advantage to the animal. I believe it will help the animal in several ways. I certainly agree with Mr. Hunt's paper, but I do not think we can discuss the paper so much from the standpoint of the theory of it as we can from the standpoint of theory and practice.

Prof. HUNT: In my own work, I do not figure out a ration for my cattle, but I have to take into consideration a good many points ; one, of course, is financial circumstances. The skill of the feeder has very much to do with this thing. There are many practical men who have spent their lives with cattle, and who succeed because they know the animals; he keeps on till he gets round to the food that he wants. If a man knows besides those things the theory and knows his animals also, he is better off. I do not believe in this theory that we can figure out just exactly that an animal must have a certain amount of liquid and a certain amount of solids.

Mr. MCKENZIE: In cattle feeding my idea is that the first consideration is that we must be educated to handle the animal and to have the proper conditions to give it every care, and then the next thing is to calculate the nature of the food and the quantity and quality ; and lastly consider the cost of this food. I wish Prof. Hunt to answer some questions with regard to nursing, handling, and stabling of animals. Some want them very warm, some no exercise, others considerable exercise. Some feed five times a day, others three times.

Prof. HUNT: In reference to the question as to how warm you should keep the animals, I may say at about 50° or 60° to start with. To explain a little further, you know if you drink a cup of hot tea or coffee, you are likely to perspire. You know if you eat a dish of ice cream you are likely to feel cool. If you run you will perspire. Those things ought to be kept in mind when we are discussing this question. If you put an animal into a warm room, the warmer the room the more it perspires, because he is cooling himself by an increased perspiration. Some people argue that we ought to warm the water up to a certain degree. It is not so much the degree at which the water is, because the pores of the body stop at once, and there is not nearly the amount of perspiration. So that, you do not gain anything like what you expect to gain by giving the animal warm water or putting him in a warm stable. With regard to the number of times of feeding, I think twice a day for cattle is just as good as any oftener. I know that some men do feed five or six times a day—men who feed for shows—but I do not think this practice a very good one. I think the ideal thing, outside of any question of expense, is to put them in a box stall, but for economic reasons we usually tie them.

Prof. SHUTTLEWORTH: We have some farmers who feed a few roots and a little while after some hay. I suppose you would call that one feed.

Prof. HUNT: Yes. There are some things in favor of both practices, but for the ordinary feeding I think the better way is to feed two or three feeds. For instance, take our own practice : we feed 30 pounds of ensilage, 5 of clover hay, 5 of meal food, and one pound of linseed meal. It would not do for us to feed 6 pounds of meal food a while, and then 6 pounds of linseed meal. We have pretty nearly exhausted our variety of foods, it amounts to feeding ensilage, hay, mill feed, and linseed meal.

G. E. DAY: Have you had any experience in feeding wheat?

Prof. HUNT: No. The average price of wheat in the United States has been 83c. per bushel, and it is sure that wheat will again be 83c. per bushel. We have over a thousand bushels of wheat in our bins waiting for wheat to come up, and we expect to get $28 a ton for it.

S. HUNTER: Would you advise us to hold our wheat

Prof. HUNT: I am responsible for the wheat that I am holding.

Mr. RENNIE: I have been very much interested in this paper. In many respects it just concides with the experiments I have carried on. Even when you know exactly what to feed the cattle, you require to use common sense. Ground flaxseed and skim-milk is what I have been raising calves on on my own place. I consider it too expensive to raise calves on new milk.

Capt. McCRAE: Would you not advise feeding a large quantity of roots, rather than grain?

Prof. HUNT: For instance, with sheep, if you feed sheep on turnips you must feed them a good deal of dry food, for there are nine pounds of water to one of dry matter. You can feed cattle more largely on roots than you can sheep.

Capt. McCRAE: Our experience here is that we find roots a very good thing, very much better than the analysis would show, for the animal system. They apparently do exceedingly well. I am feeding a considerable quantity of roots with corn cut and mixed with cut straw, and the cattle are doing exceedingly well. I was very much impressed with what the professor said about nursing; I thought of a very eminent painter who, when asked by an amateur, "How do you mix your paints, sir?" replied "With brains." So that we have to have some brains in feeding animals. It is not always those who have had the most experience in the scientific part who are the most successful in feeding.

THE SOCIAL CONDITION OF THE FARMER.

By C. C. JAMES, DEPUTY-MINISTER OF AGRICULTURE.

There are many aspects from which we may study the farmer; he is a many-sided being; his work is so varied; his life is so complex; his relations to the world at large are so extensive and important. We might consider him as a producer of wealth, as a money-maker, as a man of culture. Here we are to discuss him as a member of society. In considering his social condition we shall find that we necessarily touch upon his financial, intellectual and moral condition, for these three are intimately related and more or less dependent the one upon the other. One of the modern writers upon social progress introduces his subject by the statement that, "The promotion of social progress may be regarded as the primary object of all human institutions." Another has stated that, "The progress of society is not moral progress, or intellectual progress, or material progress; but it is the combination of all the three." At the outset, therefore, we must admit the importance and the wide application of the subject. Social and society come from the Latin word *socius* "a companion" and society has been defined for us as being "a union of many in one general interest." We need not discuss the advisability or advantage of having farmers united for their general interest; no more can we deny that farming by its very nature has to contend with many hindrances to union and the proper development of social life. Farmers are more or less isolated, not only from other classes but from one another, their work is not so conducive to social progress as the work of some other classes of workers. The social condition of the farmer has often been held up to pleasantry and even to ridicule by the writers and humorists of our cities. How often the cartoon portrays the farmer with heavy boots, coarse clothes, antiquated carpet-bag and cotton umbrella as the representative of his class. I presume the farmer would be content to "call quits" if the dude with loud clothes, big cane and receding forehead were set up as the representative of the city classes, but too often writers in newspapers and books are apt to do injustice to the farmer because of a mistaken or warped idea of the true meaning of "society."

Our young men and women on the farm are being constantly confronted with the doings of society in towns and cities. The weekly and daily newspapers give flattering reports of the various social gatherings in the towns and cities and the social advantages are thus unduly magnified. Visits to or residence in town while attending school throws these young people into a new social world and arouses the dormant desire for society; the homes to which they go are frequently more attractively furnished, the table more liberally spread, books and papers are more numerous, lectures, concerts and

small social gatherings are more common, and thus little by little the appetite becomes whetted, the home attachments dull on the palate, and, in spite of what education may do, the desire for city life becomes so strong that even the thoughts of farm work become distasteful. The social advantages of the city, real and imaginary, and the social disadvantages, real and imaginary, of the country have much to do with the rush from the latter to the former in these modern days. We all will admit that it is advisable not to unduly encourage this centralization, this draining of the farm of its best life blood; in fact we will agree, I think, that it is to the general welfare of our people that many of the best of our young men and women shall be kept upon the farm. What then shall we do? Let us turn to one of the old mythological stories for an answer. On a dangerous part of the shores of the Mediterranean there were some mysterious being called sirens who discoursed such sweet music that the sailors attracted by it, turned in their boats, were dashed upon the rocks and perished. Ulysses knowing the danger, as he passed that way, filled the ears of his sailors with wax and tied himself with knotted ropes to the mast. He and his crew passed by the danger. Orpheus also came that way, and knowing the danger, he himself produced such sweet music upon the deck of his boat, music so superior to that of the sirens, that they sailed safely past entirely oblivious to the music on the shore.

Now, let us see whether it is not possible to so improve the social condition of the farm, that go where they will, study what they may, meet whom they like, still the social life of the farm home will ever draw back with irresistible force the young men and the young women who after all are its chief ornaments.

Let us consider under the following seven heads how the social condition of the farmer may be developed and improved, viz., the farm, the farmer's roads, the farmer's house, the farmer's table, the farmer's help, the farmer's reading, the farmer himself.

The Farm. A tendency towards smaller farms should be encouraged, thereby bringing farmers closer together and necessitating a more intensive system of agriculture. Intensive agriculture means more thorough tillage, cleaner fields, increased yields, sale of concentrated products, greater return to the land causing increased fertility and, therefore, a better prospect of improved financial results. There are about 175,000 farmers in Ontario, and the farms average about 125 acres each. This will represent five families or about 25 persons resident in every square mile of farm land. In France the farms average about 10 acres giving 64 families to every square mile. The great success of France in her work of food production has been attributed very frequently to her intensive agriculture made possible by her small farms. Japan also illustrates the point. Her population is 40,453,461, and her area is 147,655 square miles of which a considerable proportion is mountain and forest. Thus with a population of 274 per square mile Japan sustains herself. Her farm holdings are small, her agriculture of the most intensive form.

It may be interesting to examine the following census statement of the occupiers of land in Ontario. The statement includes garden plots as well as farms:

Occupiers of Land in Ontario.

	1891.	1881.	1871.
Owners	224,034	169,140	144,212
Tenants	60,483	36,690	27,340
Employees	1,091	1,159	706
Number occupying 10 acres and under	108,724	36,221	19,954
" 11 acres to 50 acres	38,283	41,497	38,882
" 51 acres to 100 acres	75,307	75,282	71,864
" 101 acres to 200 acres	49,358	42,476	33,984
" over 200 acres	13,936	11,513	7,574

It will be seen that the number of tenants has increased more rapidly than that of owners; in 1871, 15.8 per cent. of the total number of occupiers of land were tenants; in 1881, 17.8 per cent., and in 1891, 21.2 per cent. Omitting the plots of 10 acres and under, which of course, refer to gardens, we find that the tendency has been towards larger farms in the last twenty years. Since 1881 the number of farmers in Ontario has decreased according to the census returns.

	1881.	1891.
Number of farmers, male	226,090	174,337
Number of farmers, female	2,822	5,245
Number of farmers' sons	71,642	113,188
Total	300,554	292,770

The Farmers' Roads. Good roads bring farmers closer together, closer to markets, closer to churches, schools and township halls. Farmers should not be prejudiced against good roads because bicyclists may be agitating in favor of them or because town and city people may be anxious to indulge in more agreeable country drives. Good roads are not a luxury; they are a necessity. Bad roads are insatiable in their constant demands upon the farmer's time, strength and pocket. Roads, like eggs, are good only when first-class. Bad roads are more expensive than good roads. Bad roads, like fair weather friends, fail us just when most needed, in unfavorable weather and times of depression. Macadam and Telford roads may be beyond our reach in most districts, but the universal earth or dirt road may be greatly improved by putting into operation a system of work that will recognize the three great elements of good roads, namely, *thorough drainage, proper grading, systematic repairing.* The following from the *Engineering News* is exceedingly appropriate and sensible. We may dismiss this part of our subject by this quotation:

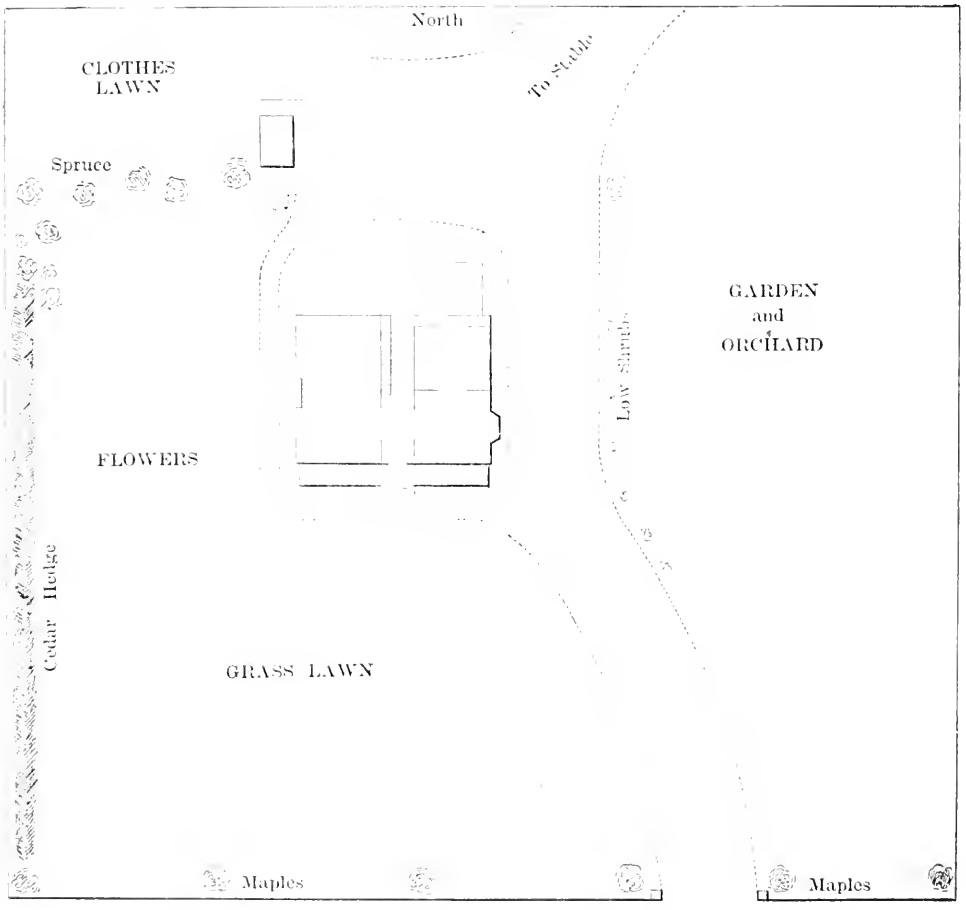
"The advantages of properly built and well maintained dirt roads seem to have been largely overlooked in the movement for the improvement of our country roads, and it has been said, with some reason, that the movement in favor of good roads has been hampered to some extent by a somewhat too enthusiastic advocacy of broken stone roads, either Macadam or Telford. The cost of such stone roads is absolutely prohibitive of their adoption in many parts of the country, where, however, improved roads are urgently needed. Comparatively little is said about dirt roads in the discussion on improved construction, but it is certain that very excellent roads may be made of earth by a proper system of construction. Both surface drainage and sub-drainage are essential in obtaining a durable road, and intelligent maintenance is another essential, which latter is rather difficult to insure. The mere dumping of piles of earth in wet spots or low places is not maintenance, but is mere waste of energy due to carelessness or misdirected zeal. With a good dirt road once completed, it would probably be found economical and advantageous to intrust its maintenance to a few skilled and intelligent men paid for their services, instead of leaving the maintenance to the spasmodic attention of the farmers and their hired men."

The Farmer's House. The importance of the house cannot be unduly magnified. It is here in the home that the women and children spend most of their hours; it is thither the men return after their hard day's work. It is the centre, the headquarters, of farm life; it is either the great attracting point that draws back the boys and girls from city and town, or it is the repelling agent that sends them off to town and city life. It is the starting point of children's lives, where the most lasting impressions are made, and which mould the opinions and inclinations to a great extent. The farmer cannot expect to have the palatial residence of the city with its superabundance of decoration, its sometimes grotesque mixture of styles, its brass knocker and plate glass; but the farmer can have a *home* just as healthful, just as comfortable and just as attractive. He can have fresh air and sunlight; he can build up his own home and surroundings, while the city resident has to buy them. The farmer can have a home built after the plan of nature; the city resident may have a residence built on the plan of the artificial.

Three things are important in the house—it should be *healthful, comfortable* and *attractive*; if it has these three characteristics it will be a home indeed, even if the cost may be measured only by hundreds of dollars. Let us consider the house as to a few particulars.

As to location the house should be placed on rising ground so as to give good drainage and an outlook. It should be near enough to the road to give a fair view of the passing travel and far enough away for a pleasant stretch of grass and a few shrubs. If possible, it should open towards the south with a verandah on the south side and one also on the west. Circumstances, of course, will control the exact situation.

The cellar should be from one-third to one-half above ground. It should be under the entire house so as to exclude damp malarial air. It should be deep enough to allow one to walk upright without danger of striking the head. It should be well lighted, divided into at least three compartments or rooms, and have a cement floor with perfect drainage. A good cellar is absolutely necessary to a good house.



The accompanying cut represents a simple but convenient arrangement of rooms. A hall runs through the centre of the house ; this gives an opportunity for good ventilation. On the west side is a parlor with an open grate. A good large open grate with logs, a few easy chairs, some papers and books—these alone suggest pictures of comfort and attractiveness to many a city business man and turn back his thoughts with longing

for the old farm home. And are they not possible for the farmer? Too often this room is kept closed all through the week and opened only on state occasions when "company" comes, especially if the company is from the city. An air of mystery, of sanctity I might say, and of mustiness pervades it. Throw open these doors, keep them open, and make that the living room, not the dead room of the house. If too large this room might be divided into parlor and study. On the east side we have a dining-room with bow window for house plants. Then comes the closet and pantry; then the kitchen. In the storey above there will be room for four bedrooms with closets *and a bath-room.* What! a bath-room in a farm house! Certainly, and why not? Are town and city people to have a monopoly of such healthful luxuries? And yet a good bath-room is hardly a luxury.

Along the front runs a broad verandah from which a fine cross country view can be obtained. The verandah might even be continued on the west side. How few farmers' families know the real pleasure to be had from a wide verandah, sheltered from the north winds and open to the southern sunshine! some farmers may say that their calling is not connected with verandahs and landscape viewing and lounging. To this we may say that the farmer and his family are as much entitled to such simple and enjoyable additions to home attractions as any other class, and a verandah is as useful and appropriate for a hardworking farmer as for anyone else. Along the pillars or supports there might be trained some climbing plants such as Virginia creeper, honeysuckle, clematis or climbing rose.

The road to the gate should be broad, well made and should sweep up to the house and past it with a gentle curve. To the north-west we may set out some spruces that in time will form a handsome wind-break; along the west, we can plant a cedar hedge; a fine plot of unbroken green grass lies in front, a few native shrubs from the woods stand where they will not interfere with the view, a few flowers to the west side and some maples along the road planted far apart. Whether maples should be placed immediately in front of the house depends upon the situation. How often the mistake is made of crowding the trees about the house—of smothering the home life. The trees are planted when young and being small they are placed too near; as they grow they crowd in further and further and shut out air and sunlight. To the traveller on the road the only indication of a house within the clump may be a glimmer of light through the trees or a curl of smoke above their tops. Keep the trees away from the house; let them form a background, a setting for the house, but let fresh air and direct sunlight in and around your house. As you approach the house in our illustration either from the east or west it stands out in full view with trees and shrubs to the right, to the left and to the rear. Such a home is worthy of a name. Every farmer should make his home worthy of a name and this name should be appropriate and attractive. The city residents are appropriating all your rights, and lodges and villas are quite commonly scattered over our crowded cities. If the city resident cannot have his country residence he can give his city house a rural name and call it a villa. Make your homes healthful, comfortable and attractive and give them appropriate names.

The Farmer's Table. What are the essentials of a good table? Food in fair quantity, fresh, wholesome, varied and well-cooked. Cannot the farmer have this? Can he not have this far better than any other class? He can, providing he takes the trouble to have a small garden and orchard. Let him see to it that the well or spring is well protected from all surface washings and underdrainage, from house, barnyard or outhouses. Let him see that his poultry is properly housed to give him fresh eggs winter and summer. Then he may have fresh water, fresh milk, butter and cheese; fresh meats, including poultry; fresh eggs, fresh vegetables and fresh fruits. The greatest dignitary of the land, the richest citizen of the state could not get better, and the farmer has usually in addition what the others too frequently are denied, a good digestion and a good appetite.

The Farmer's Help.—There are two points only that I desire to refer to here: first, more care should be exercised in the choice of men of good sound morals. The immoral farm hand may bring everlasting disgrace and ruin into the farmer's family. The young boy upon the farm will learn from him just as he learns from his father. There are good and bad among farm hands just as there are good and bad among farmers and among all other classes. The second point is that the social life of the farmer will be greatly

improved by having separate homes for the farmer's help. Thereby there will be a greater permanency in the employment of farm help, and a better distribution of the work will be possible; the farmer's family will be relieved of extra work and have the home to themselves and the hired help can have the pleasures of home life to a greater extent.

The Farmer's Reading. There are some farmers' homes to which even the weekly newspaper is a stranger; there are very many where the local paper and the city weekly or daily come regularly but to which the agricultural journal never finds an entrance. Look at the effect upon the young people who from week to week pick up the papers printed in our towns and cities filled to a great extent with political news, reports of meetings held in towns and cities, references to urban social life. Gradually there forces itself upon the mind of the young people the conclusion that city and town life counts for more than rural life and the movement citywards has already been initiated in the mind. But what a different effect, if upon the table in the farm house are to be found every week the latest and best agricultural papers, fresh, attractive, stimulating. The county paper also should be there and one of the city weeklies or dailies for the farmer needs to know the doings of the day, to be well informed in regard to markets and the history of passing events. The addition from year to year of half a dozen of the best books on agriculture will in a short time make a fair agricultural library. The business men of towns and cities find it not merely advantageous but absolutely necessary to have all the special trade journals, reports and the best books dealing with their special work, and the business men of our farms will find it just as advantageous and just as necessary to have at their command all the papers, books and reports readily procurable, that deal with their work. Anything that adds information or arouses interest or stimulates true ambition is an important factor in developing the social life.

The Farmer Himself. After all the improvement depends upon the man himself, upon his views of life, the motives that prompt him to action, the aim or ideal that he holds up before him, the sentiment that rules his every act. I need say in conclusion only this, that if you as farmers, as young developing farmers, have a true ideal of farm life and try to live up to it, if you take a proper pride in your life work, if you arouse the world's respect by respecting yourselves, if you develop within yourselves a true sentiment; if you guide your acts by the best and noblest thoughts you will do your share to raise and improve the social condition of the farmers of Ontario.

APPLE CULTURE IN ONTARIO.

By W. W. Hillborn, Leamington, Ont.

I shall deal with the practical points as briefly as possible, and then give a chance for questions to be asked; and perhaps in that way we can get at what is required the most quickly and with the greatest interest to all concerned. The remarks I shall make shall have special reference to apple culture, but they will also apply as well, or nearly as well, to most other fruits.

Apple culture is at present managed as a side issue rather than in the way of giving close attention to the wants of the tree. The consequence is that there are very many failures. When our farms were first cleared, the soil was new and rich and there were but few orchards. We could get a crop of fruit without any trouble; but as the lands become older and more orchards planted the fertility of the soil is decreased, and our insect enemies have increased and also the fungi that affect the different trees. At present it is very much more difficult to grow fruit than it was in former years. For that reason it becomes necessary to make it a special study. I shall begin with a few mistakes that are often made: First, when men order trees to start an orchard they generally know very little about varieties; and a tree agent comes around and advises certain varieties to be planted; and, supposing that the tree agent is posted, he selects the kinds the agent recommends and plants them. Of course, they are not all according

to the agent's representation. For fear of making a mistake in ordering, he will order a few of each; the consequence being that he has so many varieties that he cannot dispose of them to any advantage. Secondly, when these trees are planted the little ones take up so little room that there is apparently too much soil to be wasted; so the proprietor sows a grain crop among the trees, and the trees do not do very well, beginning after a while to dwindle, and some of them die. Third, allowing the cows to do the pruning. They do not do it so particularly as it should be done. Fourth, allowing the professional pruner to do the pruning. As a rule, the farmer has not made a study of pruning, and of course does not know how it should be done. If a professional pruner comes around, he, of course, professes to understand it. The first thing he does when he gets into a tree is, usually, if it is an aged tree, to cut out a hole in the centre and get plenty of room to work in. This allows the sun to come into the centre of the tree and strike directly on limbs that have been shaded. The bark comes off, borers get in, and the tree is ruined. Fifth, another mistake is in modes of cultivation. Sometimes a man will cultivate his orchard in good shape for a year or two, and then thinks it will do without much special care if the weather and other things are suitable. As the trees get older it sometimes happens that it is convenient to seed down the orchard or grow a grain crop. While the orchard is seeded down, the small roots of the trees come close to the surface. Of course, the ground has to be plowed up again, and a large portion of the feeding roots are thus cut off by the plow.

We shall say a few things on the method of culture. To begin with, we shall take a young tree. Always select young and thrifty trees, plant them out at a distance of about 40 feet, and give thorough cultivation by some root crop, so that you may constantly stir the soil. If you try to grow grain, it takes the moisture from the ground just when the trees require it. The idea is to stir the soil during the early part of the season, and thereby give them moisture. If the soil is allowed to become dry early in the season the trees make very little growth. If the trees become stunted while young they will never make much progress afterwards. A corn crop can be profitably grown—potatoes also—in the orchard. As the trees get older and the roots spread out they require more attention. We will always be safe in concluding that the roots reach out as far as the branches. Always give shallow cultivation, as the fibrous roots come up towards the surface. Cultivate to about the same depth each time. For this reason, I do not believe in plowing among an orchard to any depth. Of course, it is necessary to plow once a year perhaps, but do that very shallow so as not to run deeper than what you cultivate. In the selection of a place for an orchard or in the directions for cultivation it is impossible to give any general rules that will apply to all neighborhoods. We can grow apples in almost any neighborhood, but it is out of the question to lay down general rules, for the simple reason that soils and other things vary so that what suits one man may not suit the man across the road. We must, therefore, consider a tree a living thing, just as we have heard in regard to live stock. They have their requirements, and the nearer we can come to these requirements the greater will be our success. One man will plant an orchard on a piece of soil and the trees will grow very rapidly; but he gets no fruit, and he will begin to inquire and want to know why his trees do not produce fruit. He must know for himself why they do not produce—he must study the tree. If a tree is growing fast, it is possible, as I said, that cultivation has been continued too late in the fall. The soil may be naturally damp underneath and cause the growth to continue so late that the fruit buds will not mature sufficiently to withstand the winter, and for that reason will not produce a crop of fruit. Very often when we see this the cause, it is recommended to dig a trench around the tree and cut off a lot of these roots. I do not think that is right, any more than it would be to injure a cow to make her give more milk. It shows that the trees are not getting the right kind of food. It shows that they are getting too much nitrogen and not enough phosphoric acid and potash; therefore add a little bone dust and unleached wood ashes and stop cultivation, perhaps, about the middle of July, and you are very likely to start a tree into bearing. In regard to cultivation, I think that is one of the most important things in fruit culture—the method of cultivation. We should start cultivating early in the spring—early and often. The effect of cultivating will regulate the amount of moisture. In very many parts of our

country we have to contend with dry seasons. If we cannot get the moisture required we cannot expect to get a good crop of fruit; but we can get that moisture to a certain extent by cultivation. By oft-repeated stirring of the soil, just a little on top, moisture will be brought from below. It also stores up the moisture that falls at night in the shape of dew. I have found that we gain much more by stirring the soil early in the morning than by leaving it till afternoon.

Now, in manuring an orchard, we have already heard that there are ten elements required in the formation of plants and fruit. There are only four, however, which we need to consider seriously. These four we need either to supply or regulate: nitrogen, phosphoric acid, potash and moisture. Now if an orchard has been planted on low land, or land that is naturally wet underneath, we must regulate that moisture by the crop we put on the land. You will find that in some cases farmers will advocate seeding down an orchard just from the fact that the land has too much moisture in it.

In selecting varieties, I do not like to name sorts for the reason that I stated yesterday, that varieties vary so in different localities; and I think we can get at the varieties to plant best by going to our neighbors, and by following them we will be pretty safe.

It strikes me that small fruits are more neglected than they should be. I see a large number of young men before me, and it is altogether likely they will go from this College back to their farms, and I wish to impress upon them the importance of fruit gardening. If they only knew how little trouble it is to have a little plot of small fruits they would have it. It takes but a small amount of work to supply the family from the time the first strawberries ripen in June till late in the fall with fresh fruits, besides a considerable amount for canning; so that you can have fruit on the table every day in the year. It is just as easy to grow these small fruits as it is to grow potatoes—in fact I can grow them easier. By planting all these small fruits in rows so that all the work can be done with a horse, it is just a matter of an hour or two a day for, it may be, three or four times in the week to have all the small fruits that any family would want to use.

Mr. KEIL: If tiles were put in an orchard, where would you advise placing them

Mr. HILLBORN: I would recommend them to be put in half way between the rows and very deep, unless the soil be a very retentive one, and then not too deep.

A. G. McKENZIE: What about planting on a northern slope as against a southern or eastern?

Mr. HILLBORN: I would select a northern slope for all fruit except grapes. The great difficulty with a southern slope is that you get the direct rays of the sun on the tree in the winter. If you notice the little branches, it is always on the south side that it is killed, while the northern side may be quite green. I have known people who have sometimes planted a tree on the south side of the house instead of the north side. A tree will stand very many degrees more cold on the north side than on the south. The sudden changes are what cause the difficulty.

Prof. PANTON: How did you originate the Hillborn raspberrys?

Mr. HILLBORN: It was grown from the seed of an old raspberry plant. In the first place, the original plants came from some nursery on the other side. I planted about an acre of the seedlings, and then I selected the best ones and produced the fruit from that.

Mr. S. HUNTER: To what age will an average bush be profitable?

Mr. HILLBORN: I have picked a quart of fruit from the Hillborn raspberry when it was one year old, but they will begin to pay the second year from planting, and with reasonable good care afterwards—it depends upon the method of culture—they should last from eight to ten years. I saw a plantation that was 14 years planted, and it was apparently in perfection at that time.

A. G. McKENZIE: What would guide you in selecting good nursery stock as to situation? Some say go north, and others to select some hardy tree and graft on it.

Mr. HILLBORN: I would first say that I would go to some reliable nurseryman. Deal direct with the firm; and in that case you are pretty sure of getting what you order. I would not be particular whether they were grown in Canada or just across the lines. I would not care, however, to go too far south of our own locality—100 or 200 miles does not make much difference. If we bought our trees and brought them from the south in the fall they would be tender—somewhat after the fashion of a hot-house plant; but if we get them in the spring, they harden in the summer.

Mr. S. HUNTER: How would you grow a rather tender variety—by grafting, or how?

Mr. HILLBORN: By top grafting on to some hardier variety.

A FEW THOUGHTS ON THE FARMING INDUSTRY.

Wm. Mulock, M.P., read the following paper: You have done me the honor of asking me to write a paper on the subject of "How to Improve the Financial Condition of the Farmer," and on beginning its consideration I at once thought of the relation of the farming industry to what is commonly known as the trade question. But feeling assured that the subject was to be treated wholly regardless of the trade relations between Canada and the rest of the world at any particular time, I have directed my thoughts without reference to tariffs, but solely to those conditions which under all tariffs affect for weal or for woe the condition of the farmer. Further, I have been obliged to change materially the title, for to write under that assigned would be to imply that no farmers are now adopting the best methods. This would be an indefensible position to assume, inasmuch as in Ontario to-day are some of the best farmers to be found anywhere, whilst progressive farmers are successfully pursuing their calling in all parts of this province. For such as these I could not venture to offer any suggestion, and my observations must, therefore, be regarded as intended solely for those who may yet regard farming as largely a matter of chance and accident and not an industry based upon scientific methods.

Further, I would say that it is with much hesitation that I venture to offer any suggestions to an agricultural audience, being but as it were an apprentice and not a master workman in the craft. Still believing that we all may be able to contribute some little useful information to each other, I venture in that modest spirit only, to respond to your kind invitation by giving expression to a few thoughts on the farming industry. First, I would say that

Farming is a Science and not a Game of Chance.

When we had our virgin soil, supposed to possess inexhaustible fertility, nature gave a bountiful return notwithstanding the most improvident methods of cultivation, but now experience has taught us that the fertility of the soil must be maintained if we are to get productive returns. And as the whole financial success of farming must largely depend upon the productiveness of the soil, my first thought is how profitably to increase the means of fertilization. It is idle to preach economy if the farm yields but the barest pittance of a living. It should be the aim of all to so conduct their business that those engaged in it shall enjoy a reasonable share of those comforts in life which increase human happiness. An industry which yields but starvation returns affords no opportunity for real economy. To those then who are continuously scolding the Canadian farmer, accusing him of extravagance and improvidence, I would say with some knowledge of the conditions that the charge is as a rule unwarranted. Why should a farmer be denied those reasonable comforts and means of improvement that are supposed to be the legitimate right of many other classes who certainly do not toil harder. Therefore I would say, that, combatting as I do the arguments of those who attribute all financial embarrassments of farmers to alleged extravagance, our attention should be rather directed towards endeavoring to increase the profits accruing from farming so as to enable the farmers to enjoy a fair share of the

advantages of our civilization. I have suggested that farming must be conducted on scientific principles, and the first step towards successful farming I think is to increase the yield of the farm. How to do this involves the adoption of certain methods which science and experience alike teach us lie at the very threshold of successful farming, and first in importance is

Underdraining.

Some soils resting on gravelly or other porous foundations may not require underdraining in the ordinary sense of the term, but even these may need openings to allow the water to escape from the gravel, etc. With these exceptions all farm lands should be thoroughly underdrained Without proper underdrainage the land never yields a full return for the labor performed upon it. On my farm I have some land underdrained with parallel drains, 24 feet apart, and alongside of this same land other land equally as fertile and as favorably situate, but not drained, and I think I am safe in saying that my underdrained land yields me fully one-third more than does the adjoining land not drained. The cost of cultivation of each kind is the same per acre, and the extra crop of about two years will pay the cost of underdraining. The farmer, therefore, whose land is not drained is losing annually about one-half as much crop as he secures. What business so conducted can be a financial success? Especially at the present time, with the prevailing low prices of farm products, every acre must be made to yield the most generous response to the demand of labor expended upon it. Again, then, I repeat that underdraining in my judgment is absolutely essential in order to successful farming. Whilst to be in debt is to be in danger, I think the cost of underdraining is one of the few expenses for which every farmer is fully warranted in going reasonably into debt. Assuming then that the land is properly prepared for cultivation, the next question is

How to Increase the Means of Fertilization.

The staple article is barn-yard manure, artificial fertilizers being expensive and not always satisfactory. The average Canadian farmer engaged in mixed farming does not, I think, expect to be able to manure his land oftener than once in six years. Everybody admits that this is insufficient manuring, and the problem is how may he increase his supply of manure.

Intensive, not Extensive, Farming Ought to be the Aim.

The yield from market gardens tells us how much more such land yields than does the ordinary farm. Now inasmuch as the cost of cultivation is the same whether the land be well or poorly manured, is there no way by which every farmer may at a reasonable cost increase the quantity of manure within his reach? I think there is, and that source is the system of

Green Manuring.

Science tells us that out of every 100 parts of atmospherical air, 78 parts are nitrogen, which is the main fertilizing element in barn yard manure. How can this nitrogen be brought down and supplied in an available form as food to our growing crops? The process is simple, comparatively inexpensive and certainly most effective. Certain plants, such as clover, peas, beans, buckwheat, etc., have the property, when growing, of storing up large quantities of nitrogen, and when plowed in, this nitrogen is immediately available for plant food, thus taking the place of the barn-yard manure. On my farm I have experimented with fall rye, clover, green peas and buckwheat. At the rear end of my farm is a sandy field nearly a mile from the barn-yard My farm was one of the earliest settled upon in the county of York, and I assume that little if any manure was ever drawn to the field in question, for after attempting for several years to grow a crop upon it I came to the conclusion that the soil was absolutely exhausted, and accordingly

set about the experiment of endeavoring to restore its fertility by green manuring. I may say that the soil was so light that everything seemed to burn up in hot weather. I began the work of fertilization by sowing it with fall rye, and clover on this in the spring. When the rye was pretty well grown, but before it had commenced to get hard, I cut it down, allowing it to remain on the soil as a mulch for the clover. This protected the clover so that it lived well through the dry season and in the following year the clover when in blossom was plowed under. This field I sowed with fall wheat and had a reasonable crop, by far the best that I had yet gathered, but still not an average crop. Again I sowed this field with rye and plowed it in in the spring as before and kept the top of the land worked until fall when I again sowed it with fall wheat, and this year had a crop exceeding 30 bushels to the acre. I have also experimented with green peas, and now make it a rule instead of having fallow land for fall wheat, to treat the land as follows: plow in the fall, and in the spring work it well on top until about the first of June. This cleans the land; then sow with peas and in about sixty days, say about the first of August, plow in the peas. They will then be in blossom, and by the first of September, when the fall wheat should be sown, they will be absorbed by the soil, and the nitrogen so taken from the air be immediately available for plant food. A crop of green peas, so far as my experiments have gone, appears to produce results quite equal to those from a good coat of barn-yard manure, and the only cost is the seed, the labor involved being no greater than the labor of summer fallowing. I am not able to say whether the effect from such green manuring is as lasting as that from ordinary manuring, but this system of green manuring does enable us to supplement the supply of barn-yard manure, and thus to increase the fertility of the soil and the return therefrom, and again illustrates the proposition that farming is a science and not a game of chance. My own experience causes me now to always grow a crop of green manure for my fall wheat instead of letting the land lie fallow and bare, when if allowed to bake and get dry, it loses instead of gains fertility. There is no profit in endeavoring to cultivate more land than you can properly manure. To do so involves a waste of energy and pecuniary loss.

Agriculture is a Progressive Science,

and involves study as do other callings; but the successful agriculturist must not be a mere theorist or book scholar, but must be able to make a practical application of scientific knowledge. Science tells us that we have an inexhaustible supply of nitrogen in the atmosphere right above our farms, and that in the economy of nature certain plants such as those named are able to render this nitrogen available as plant food and to store it up in large quantities for man's use. Why not then accept this proffered gift from nature by making at least a part of your land grow its own manure?

Now, proceeding a step further and assuming that we are conducting our farming operations so as to get the best yield from the land, I would call attention to the importance of farming operations being guided with regard to

Some Definite Policy.

For example: Is it possible for the farmer to profitably carry on his industry throughout the whole year, or must the winter months be largely devoted to chores and waiting for the arrival of spring? In this age of keen competition few if any businesses admit of any considerable suspension of operations. With regard to the character of the farming, some prefer a specialty, such as dairying, fruit farming, etc., whilst others go in for mixed farming, the latter in fact being the general character of the Canadian industry. Now it seems to me important, considering our long winters, that we should endeavor to so conduct our farming operations that the farmer may find profitable employment on his farm throughout the winter. How may he secure this? A successful farmer has said that he liked his crops to walk to market—in other words, to feed his grain and sell the product of it rather than the grain itself. The ensilage system enables us to overcome largely the disadvantages of our long winters and to compete successfully in the

industry of fattening cattle with countries having a somewhat milder climate. The cost of a silo is now within the reach of almost every farmer and considering that it is estimated that an acre of green corn has a feeding property of about five times that of an acre of hay land the advantage of this system of raising cattle food is manifest. Moreover, it enables us profitably to market our coarse grains whilst we have the manure remaining, and thus the producing power of our farms is increasing every year so long as we continue this system.

Dairying.

To those who make dairying a specialty, I would say that it is, I think, of the utmost importance that they should seek to supplement their pasture by the soiling system. Let them sow some green crop to be fed to the cattle during the dry season. We know with absolute certainty that year in and year out there comes a time in the summer when the pastures are dried up, when at times even the wells dry up, and flies and heat torment the cattle. Unless these results have been anticipated, the supply of milk falls off, the operations of the cheese factory become unsatisfactory by reason of the unequal supply of milk, and the cows can never be gotten back to where they were before the flow of milk fell off. To make dairying a success, then, I think it is necessary to supplement the pasture as I have before stated, with a green crop, tares, vetches, oats, corn, etc. A very small acreage will do the average farmer to make the summer's dairying operations a success instead of what often happens, a failure. As a permanent soiling crop I recommend lucerne. It is a deep feeder, the roots extending below the drouth line, and can be relied upon when almost all other vegetation has failed from heat and drouth. No doubt other methods can be suggested whereby the farmer may be able to profitably carry on his industry all the year round without regard to the season, and I only cite these as two of many possible illustrations of the proposition now under consideration. Again, I would say that in order to succeed the farmer must

Adopt Business Methods

in connection with his calling. In other callings, merchants watch the markets, sell when they can make a reasonable profit, and generally adopt business methods in marketing what they have for sale. Why should the farmer in selling his cattle depart from sound business principles to sell them to the drover by the head instead of by the actual weight? He may think that he is a better judge of the weight than the drover, but I should be sorry to put my judgment against that of any person who is an expert in his trade. I merely allude to this system of doing business in order to urge upon the farmers the adoption of business methods and not those of chance. And upon this point I would say that it is of the utmost importance to the farmer that he should keep full accounts of his business transactions as would any other business man.

Thus far my remarks have had reference to the earning power of the farm. Let me venture a few remarks of caution against loss. If our whole energies are devoted to earning, and no caution taken to husband those earnings but they are allowed to go to waste, then we are in no better position than the owner of the best milch cow in the world which after filling the pail kicks it over. Assuming that my ideal farmer is married and has a good wife, I would tell him that "A good wife and health are a man's best wealth." Therefore let him encourage his wife, for a man can hardly prosper without his wife's consent and aid. And

Let the Farmer not Overwork Himself.

It is false economy to do so, for it undoubtedly impairs his after usefulness. Let him acquire habits of regularity, and if possible keep ahead of his work. When once the work gets ahead of a man, to say nothing of the loss resulting from operations under such circumstances, the farmer becomes a prey to worry and it is undoubtedly true that freedom from care promotes longevity. Mr. Beecher has stated that "worry kills more people than does hard work." Therefore I would impress upon every farmer to conduct his operations as to avoid as much as possible all gnawing worry.

It has been well said that it is easier to make money than to keep it. One good way to lose it is in the tavern and the saloon ; and it does not take long for a person to drink down the value of a farm and put his wife and children on the road. The successful man, be his calling what it may, must be temperate.

Another pitfall is debt. "A man in debt is caught in a net." He is more or less at the mercy of his creditor, and being behind-hand is obliged to buy on credit and pay credit prices, which means bearing a share of all the bad debts of others. Again, it is necessary to

Avoid all Bubble Schemes.

Glib-tongued agents may tell us of the advantages of lightning rods on every square yard of our buildings, may offer patent rights that will make a pound of butter out of a pound of milk, that almost promises to turn iron into gold, but the philosopher's stone has not yet been discovered.

Thrifty habits and hard work guided by intelligence, are the only passports to success. It has been said that lawyers are a necessary evil. Every man values what he deems his rights, but the prudent man will hesitate a long time before embarking in litigation. A trifling quarrel over a line fence may lose both neighbors their farms. "The suit is ended," said a lawyer, "both parties are cleaned out." Therefore, my advice is, avoid litigation if possible. But I might go on in many other ways to point out the dangers that beset the farmer's footsteps. For example, this has been an age of wonderful progress in the invention of agricultural implements. The prudent farmer will not be the first to buy every new-fashioned implement, but will wait until it has been thoroughly tested and until its price has become reasonable, and even then he won't buy it except for cash, and until he can pay cash will put up with what he has, and when he has purchased his implement he won't leave it exposed to the weather all the year round. And so, generally, in order to success in all operations, waste of every kind must be avoided. No man, however wealthy, can afford to waste anything.

But I have already trespassed too far upon your time. One word as to one policy that should guide the farmer's operations. Let him ascertain for himself what he can produce for which there is the most remunerative market, and to do this he ought to

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and a newspaper. The one will afford him useful information as to his calling, and the other as to business connected with his calling and general information. In this age of change and progress, it is necessary in order to success that every man should keep abreast of his calling, and this he cannot do if largely isolated from the business world, as he will be without the use of some public journal.

Finally, let him do his duty as a citizen, by standing by those public institutions of learning that are doing so much for the advancement of science, including that one which for efficiency and thoroughness of work both in the college, in the field and in the farmers' institutes, has placed itself amongst the foremost of agricultural colleges in America. It is needless to say that I allude to

The Ontario Agricultural College at Guelph.

It is always difficult to trace direct results from educational institutions, but the triumphs won by Canadian exhibitors of dairy products at the World's Fair constitute but one of many valuable results that have accrued to the people of Canada from this College under the able administration of President Mills, and I bespeak from the *alumni* and all other friends of progressive agriculture, that sympathy and support to him and his efficient staff in their high and responsible positions so necessary in order to the attainment of the best results. There are those who, whatever be their motives, are unfairly attacking and would destroy this College. To them I would say that it being universally recognized that successful farming must be based on scientific methods, their unpatriotic action is against the best interests of the farmers and of the whole country.

Any unfair attack on this College is an attack upon our farmers' institutes, our agricultural societies, this *alumni* association, and all other organizations for the purpose of advancing the farmer's interests, all of which are, as it were, schools for the dissemination, each in its way, of useful information. Let every farmer be ever seeking useful information bearing upon his industry. The progressive farmer, even if a graduate of an agricultural college, in order to secure a successful place in his calling, will not cease to be a student on leaving his college halls, but, as he journeys through life, will continue to find "tongues in trees, books in the running brooks, sermons in stones, and good in everything" To such a farmer success will be the reward.

A. McKENZIE: There is one phase of the paper which interests myself indeed, and that is the part that applies to the uniformity of work and the occupation of the winter months. We find it very difficult on the farms to secure good hired help. I think one of the reasons is that we cannot give good wages all the year round. Men wishing to obtain good wages all the year round will go to other places and leave the farms. Now, if we could so regulate the work as to give good wages all the year round and have the work regular it would be a very great advantage.

Prof. DEAN: Mr. Mulock, in his excellent paper, says that it is important that a farmer should have a supply of green food for summer. I have advocated that, but never had it so much impressed upon me as this summer. In the north-west of this province I found the creameries were shutting up a month earlier than usual, and a number of cheese factories were closing because they could not get a supply of milk and cream; and the reason was there had been no provision made for green food. Last year, we had very good pasture most of the time, and some people have made a mistake by risking it for this year also. There is very little danger of us having too much food on hand, as we can use it in the winter. He also speaks about those fellows who go around talking and trying to make you believe that they can make a pound of butter out of a pound of milk. I have tried myself the black pepsin process and one or two other modes, and we have been promised Thurston's new process, giving an increase of 30 to 40 per cent. We have read of a reporter who saw an increase of over 100 per cent; they took a certain number of pounds of milk and got so much butter, and the next day got an increase of 100 per cent. I could take the milk from a couple of cows and get an increase of 200 per cent. on what was obtained from certain other cows, because there is such a difference in the quality of milk. I have very little sympathy for anyone who will invest money in that sort of thing.

R. F. HOLTERMANN: There was one thing which Mr. Mulock referred to which is of vast importance, and that is to buy for cash. He says very correctly that the man who buys on credit must pay for the bad debts of others. If you buy for cash, you can go to any store-keeper and get the bottom prices, he can afford to give it to you. I believe farmers generally buy in too small quantities. The store-keeper cannot afford to weigh out 10 lb. of sugar at the same rate as he can sell a barrel for. I have always maintained that the farmers are making just as much progress as the business men—only 17 out of 100 business men make a living.

S. HUNTER: It is quite evident that this paper has not been gotten up hurriedly. I differ, however, in some things from Mr. Mulock. The ideal farmer, which Mr. Mulock says we should all be, cannot be found on every farm home. The man that can use science in his work is the man who will succeed. Science, to put it in the simplest English that I have, is knowledge applied; and if we have knowledge and can apply it, there is no difficulty in making farming pay. The men who are applying knowledge properly in farming are not the men who are complaining of hard times. We will require to get our average farmer educated to a little higher level than he is at the present time. I have no sympathy with a man who is suffering in any way, who is in possession of knowledge to do his business and does not apply it. Mr. Mulock says we are blamed for being extravagant, and he believes that we should enjoy life and have all the comforts in life that men in business have. We believe that, but we also believe that we have to wait for these things. If we have the means, we should not deprive ourselves of the comforts; if we have not, we should wait till we have secured the means, and then the comforts will

be enjoyed better after. We like the idea of paying cash for everything when we can, but then the poor man cannot pay cash. It is much better to buy one bar of soap and pay for it than to buy a box and go on credit for it.

J. S. PEARCE: This is a very important question with regard to the trouble about the financial situation of the farmer. There is too much credit in this country. I am satisfied that if our farmers will open a bank account and be in a position to raise $25 or $100 any day that he wants it, he would save thereby in many instances 25 per cent. It is not a disgrace to a man to borrow $50 or $100; and he can easily arrange with a bank by which he can open an account and have a certain amount to his credit there; and if it is overdrawn occasionally, the bank will not worry him very much. Again, with regard to the question that Mr. Hunter raised about the intelligence of the farmer, I think there is a grand opening for this Union to do what might be termed missionary work along that line, and try and encourage and stimulate the farmers in the neighborhoods from which these young men come to get out of the rut in which they now are. If this Union were run along on that line it would be a good idea, and I think there would be a great deal of improvement and a lot of good done. Mr. Mulock also mentions another very important thing, under-draining. I think there cannot be too much importance attached to that; and I have told friends of mine that if I had to borrow money, I would do so and put it into tile. I want you to remember that what I am saying is not presumption—I have been on a farm all my days. I want to give a little illustration of the results from under-draining that has come under my own experience; some five or six years ago I rented a small plot of land consisting of five acres for market gardening. There were no drains in this land, and the owner thought there was no occasion for under-draining, as the soil was somewhat gravelly. I worked it for one year without tiling, and then went to the landlord and asked him to assist me in putting in tile. No, he said, that land is better without drains. Finally, I put tile in at my own expense, and from that piece of ground after under-draining, the crops have been four or five fold greater than they were before.

Dr. MILLS: My name is down to take part in the discussion to day, but I decided to leave it entirely to others. I wish simply to make one or two observations. Mr. Mulock is himself an educated man, a scholar in every sense of the term, and a public man who is in close contact with the farming community. There are very few public men in this country who are in so close contact with the farmers of Ontario as he is. I may say that when we were about constructing the farm buildings here, I visited Mr. Mulock's barns; and in regard to the arrangement of the box stalls, movable troughs, etc., the idea came mainly from Mr. Mulock's. I wish simply to express my opinion of the paper as eminently useful, comprehensive and in every sense practical. I join you in expressing my appreciation of it as a whole.

T H. MASON: I think on the whole that Mr. Mulock's paper is an admirable one. At the present time we know that in a great many lines of farming, on account of bad markets, that the margin of profits is very small, and in fact nothing at all. I was told by one of the best farmers in the province of Ontario that his net receipts last year were something like 3 per cent. As Mr. Pearce suggests, I think this Institution should undertake missionary work in this line.

BRAIN AND MUSCLE ON THE FARM.

Hon. JOHN DRYDEN: I am sorry, Mr. President, that I was not in when the last paper was being read. I have listened to what some of you have been saying, and I think I have pretty well the gist of it. First, I want to say that farming for glory or for the fun of the thing has never been a very favorite pastime in this or any other country. The hope of gain, after all, is the chief thing which is considered. You will agree with me that the ideal object that the farmer has in view is to produce the best possible quality and the greatest possible quantity with the least possible outlay of labor and

capital, which, when it is produced, ought to be sold in the best market which can be found. If I were to suggest any two things which would improve the financial condition of the farmer, it would be these: first, give him access for his products to the best markets of the world, and, secondly, give him such information and such instruction as will enable him to produce the best products in the world. Then, in that way, you would cover all that is needed. The best market may be in one place or it may be in another; and, therefore, I would say that the best market is generally the broadest and most extended market. The best market might be right at your own door; then, if it is, you have the advantage of paying no transportation charges, fees, etc. On the other hand, if a market which is a long distance off is of such a character that after you have paid transportation and other charges it still affords a better return than the one at hand, that is the best market in which to sell your products. In Great Britain the farmers there have the best market right at their own doors; they avoid all charges that are placed upon the articles that are being sent to that market. If you and I were confined to the market in our own country, it is manifest that a good deal of our land would soon have to go to waste. So that it is taken for granted that if we are to have the best chances we must have access as far as can be (without speaking specially of any political questions of the day) to the best market. We should produce an article in which we can excel, and which we can produce at a profit. Now, that is an advantage which is very desirable and is perfectly patent to everyone. In other words, the stock raiser should produce the very best stock, the bee-keeper the very best honey and the dairyman the best dairy products The farmer should choose which of all the products he would make a specialty of on his own farm, or which would best suit the special circumstances in which he finds himself placed. Taking that for granted, I may say that the farmer's position will be improved by a study of the soil which is found on his own farm. So far as I have been able to judge, I think the paper given by Mr. Mulock is an admirable one; but I have this to say, that what might suit Mr. Mulock might not suit Mr. Hillborn and might not suit me at all in the county of Ontario; and, therefore, I am bound to consider the special conditions in which I am situated. The fact is we have too many *imitators* among farmers—men who are not thinkers and who will not study out for themselves what is the best to do I cannot give a rule for you, and I do not want you to give a rule for me; I must look out for myself in that regard. I do not need to stop to give you illustrations, but I have seen hundreds of them in my own section of the country. I have seen a man watching another man who is growing an excellent crop of fall wheat, and he wakes up and says, "Here is a grand way of growing wheat." He buys some seed and sows it, but under circumstances not at all similar to those of the man who has grown the good crop. The chances are that he has wasted his labor and seed, because he is a mere copyist. Now, if our farmers wish to better their financial condition, they must not do that, but study their own circumstances. Again, do not undertake too much. I have made up my mind that in these days the man who is a skilful manager on a small farm comparatively will do better than the man who manages a larger farm with less skill. In the older days, when the growing of grain was remunerative, it was different; but now we have to concentrate our crops; and when that is the case, there is a great deal more attention needed in the details of farming; and I generally discover that the man on a small farm will do better proportionately than a man on a larger one. In connection with this, his position will be improved if he will bear in mind that he cannot succeed on any of the old line. haphazard methods. Whatever you do is worth doing well, and the difficulty is that so many of our farmers neglect this thought altogether, and they are careless in all their operations. This applies in every department; grain growing, stock breeding, dairying and in every other department. Take the man who is growing grain. You had it brought out in Mr. Mulock's paper, and I believe that a greator amount of success is due to a proper tillage of the land than most of us have been wont to believe. Some think it does not make any difference how you cultivate. If a man ignores this thought, and does not do every part of it well, he will find that he is the loser and not the gainer. If we shall make progress in connection with this agricultural industry, we

need to adopt the most economical methods—that is to say, we want to get the greatest results with the least outlay of capital. The merchant has to study his business; and we, if we are going to succeed, must study ours also. Now, when I speak of economical methods, I do not mean that we are not to spend any money in the development of the farms on which we are placed. Not to spend money on drainage is parsimony, not economy. There is no doubt at all if there is one thing which should receive our attention more than another it is the subject of drainage. I suppose that some of you have seen just what I have observed—you have seen land pay for the drain the very first crop that was taken from it; and still there are farmers who refuse to drain their farms. They are too stingy—when they get a dollar they stick it in the bank or in the vault, and say, "I will not let that loose." If I can spend a dollar and make five I am foolish if I do not do so, if I want to increase and better my financial position. I have seen men in such a position that if they had purchased a machine it would have paid them tenfold, and yet they refused to do so, and have wasted money and energy. The farmer ought to be business-like. Why should he not be? Why should we not consider that our work requires business methods and business habits just as well as any other? But the fact is, if you go to any place in this province you will find numbers of farmers who never read a solitary paper; they have not even a weekly in their possession, much less any agricultural papers —the fact is they do not know what the market is. A great many of our farmers do not succeed because they have no capital. How many times I have seen men start with no capital. Such a man is handicapped from the first, and will lose in his business. I would rather see a man work for some person and get a little capital before he starts business. A merchant cannot succeed without capital; and I fancy that because such a large percentage of the business men fail is really on that account. In England, a landlord will not rent to a man who has not the capital. They require him to have a certain amount of capital, so that he can work to advantage. That is manifest, and the farmers would be in a better condition if they were able to hold their products and not be compelled to sell and pay interest, which might be necessary in some cases, but which is a little dangerous after all. I could take you in my own township to men who are as industrious, as intelligent, and as successful as most farmers, but who are going down because years ago they borrowed, and the reduction in value of farm crops and farm property has been so great lately that it is likely to take away all they have. I do not say that Mr. Pearce is not right in his arguments, if a man does not go too far beyond his means. I believe that farmers, more than any body else, need to be thinking men. How will they become thinking men? By becoming educated men. I have seen men who could not read or write very well, and yet I call them educated in the sense that I am suggesting. They have got their education, however, in a very hard school—by experience—by having blundered and made mistakes; but they have been thinking men and have taken advantage of their various experiences, and profited by them. It is manifest that if the condition of the farmer is to be better financially he must be in the sense that I am suggesting an educated man. He must not be afraid of science either. So many farmers are afraid when you begin to talk about science. What is it? It is simply truth in reference to agriculture. If the science be correct, that is what it represents. I need not be afraid of all you can bring to me along that line; but while I am not afraid of the science of agriculture—of learning about the science —I ought not to be ashamed to acknowledge and to take hold of the practice of it as well. Science is of no use unless you bring it down to some practical use. Your scientific investigations are useless unless some one is going to be able to put them in practice. Now, I ought not, therefore, to be ashamed to put knowledge into practice. One of the things that will improve the financial condition of the farmer is to allow the muscle and the brain to go together. I am delighted that in this province we have got so good an equipment in order to afford this special advantage—where a young man, if he desires so to do, can become educated in this way; not that he can acquire knowledge merely, but that he may become a thinking man. He requires such education as will enable him to think out his own course in after life. I am glad to say that this institution is so valuable a one in this direction. We have scarcely begun as yet to see the good results which will flow from the education which is being given in this institution. Sometimes in the Legislature

I am attacked by being asked, "Where are your men?" We do no find them. And they say, "You had better stop this education. They are not numerous enough." Now, it takes a great many years to fill up a province when probably from 50 to 100 are sent out annually. It takes a long time to permeate the whole community; and whoever lives to see it will find that in this province the farmers will occupy more than they have in the past a first place among the farmers of this continent. I would like to say in the presence of Prof. Hunt that we are now finding some of our brightest and best young men in this country going to work on the farm. They are properly equipped and drilled and educated, so that they will be able to think out the proper course which they are to take in after life. It is certainly being done, and will redound greatly to the advantage not only of the agricultural interests of this province, but to all the people who dwell in this land.

REPORT OF COMMITTEE ON ECONOMIC BOTANY AND ENTOMOLOGY.

Presented by Prof. J. H. Panton, Agricultural College, Guelph.

The committee appointed to collect information regarding the presence of injurious insects, fungi and weeds throughout the Province of Ontario, sent out 100 circulars of enquiry to the secretaries and some others of the Union; 50 of these were returned containing replies to the questions issued. These 50 embrace 30 counties, as follows: Addington, Lennox, Russell, Prescott, Hastings, Frontenac, Glengarry, Lanark, Renfrew, Prince Edward, Ontario, York, Simcoe, Peel, Wellington, Perth, Oxford, Middlesex, Brant, Haldimand, Lincoln, Welland, Kent, Peterborough, Bruce, Grey, Muskoka, Monck, Haliburton, Dufferin.

The replies may be thus summarized:

Weeds. Forty different species are referred to, but only eleven are named by ten or more correspondents. The following is the list with figures indicating the number that referred to each:

1.	Canadian Thistle (Cnicus arvensis)	42
2.	Mustard (Brassica Sinapistrum)	36
3.	Couch grass (Agropyrum repens)	28
4.	Burdock (Arctium Lappa)	26
5.	Ox-eye Daisy (Leucanthemum Vulgare)	25
6.	Ragweed (Ambrosia artemisiaefolia)	24
7.	Pigeonweed (Lithospermum arvense)	22
8.	Cockle (Lychnis Githago)	20
9.	Wild Oat (Avena fatua)	18
10.	Pigweed (Amarantus retroflexus)	15
11.	Wild Tare (Vicia Cracca)	12

In connection with weeds the use of common names leads to much confusion when reporting upon them. For instance, Redroot is applied by some to No. 7 and by others to No. 10; Pigweed is applied to No. 10 and the so-called Lamb's Quarters (Chenopodium); Dock is applied to Burdock and true Dock (Rumex); Wild Tares are frequently called Wild Peas.

It is pleasing to notice that Chess is reported as a species of plant, and not a modified or deteriorated wheat plant.

Bulletin xlvi, or Report O. A. C., 1889, and Bulletins lxxxv and xci, or Report O. A. C., 1893, will be found of service in the study of weeds.

FUNGI. Among the mildews, rusts, etc., we find reference is made to 24, and of these only the following are referred to by ten or more observers :

Rust (Puccinia graminis)	36
Loose Smut (Ustilago Carbo)	18
Rust (Tilletia Cariss)	16
Smut (corn) (Ustilago Maydis)	20
Potato Blight (Phytophthora infestans ?)	30
Black Knot (Plowrightia morbosa)	25
"Spot" on Apple (Fusciladium Dendriticum)	23
Grape Mildew (Peronospora Viticola ?)	13
Pear Blight (Entomorporium maculatum ?)	12
Pear Mildew (Perono spora Viciæ)	10

The reports upon injurious fungi are not as definite as desired, owing no doubt to the fact that most observers consider some of these plants as the same species. For example, loose smut and smut are entirely different types of smut ; the former readily seen as black masses ; the latter concealed in the kernels, which are known as *smut balls*. We find the same difficulty arising in speaking of potato blight, of which there are at least three types. Some use the term blight or rot for all the kinds. Three types of fungoid pests affect the grapes under the name mildews by some. Observers should as far as possible give the particular type in each case. We have no doubt that ere long, as a knowledge of these obscure forms of plant life becomes more general, the indefiniteness referred to will be a thing of the past. Rust and smut seem to have been quite common, the former likely owing to climatic conditions when it appeared ; the latter may have been from sowing smutty seed. It is to be regretted that so much black knot can still be seen and allowed to remain on the trees as centre of distribution. We would refer observers to consult the following bulletins and reports for information upon rust, smut, etc. :

Bulletin II, or O. A. C. Report, 1886, Potato Rot ; Bulletin XXXVI, or Report O. A. C., 1888, Rust.

Bulletin LII, or O. A. C. Report, 1890, Black Knot ; Bulletin LVI, Report 1890, Smut.

INSECTS. Fifty species are referred to, the most common being :

Potato Bug (Doryphora Decem-lineata)	39
Grasshopper (Melanoplus femur-rubrum)	31
Cabbage Worm (Pieris rapæ)	27
Codling Moth (Carpocapsa pomonella)	24
Tent-Caterpillar (Clisiocampa Americana)	21
Turnip Fly (Phyllotreta vittata)	20
Curculio (Conotrachelus nenuphæ)	18
Currant-worm (Nematus ventricosus)	18
Cutworms (Agrotis)	17
Wireworms (Agriotes mancus)	16
Apple Borer (Saperda candida)	12
Clover Midge (Cecidomyia Leguminicola)	11
Pea Bug (Bruchus pisi)	10

From the replies it is readily seen that two insects not usually common, appeared in many places, viz. : grasshoppers and aphis upon turnips, rape and cabbages. One observer refers to the larva of a moth (Drasteria erechtea) affecting the clover. A correspondent refers to a "new pest" preying upon forest trees, but gives no description of it. The increased distribution of the horn-fly (Haematobia serrata) is quite marked ; replies referring to it have been received from Bruce, Perth, Oxford, Middlesex, Ontario, Prince Edward, Simcoe, Carleton. The tent-caterpillar (Clisiocampa Americana) seems to have become common again. We have found some difficulty in determining the exact species in

this case; but as some referred to the species mentioned, we were inclined to think that it was the one generally observed. Reference to Bulletin LXXXVII, or O. A. C., Report, 1893, will give information as to the best way to get rid of many, if not all, of these pests.

The committee thank the observers for the trouble taken in assisting them to inaugurate their new work, and hope they will as readily aid in the work as long as it continues. In further work we would recommend correspondents to mention any new weeds, blights and insects that have appeared in their districts as well as the most injurious forms. The Professor of Natural History at the College will always be pleased to assist in determining species of plants or animals referred to him, and will consider it a favor to have such sent him at any time. We have no doubt that if this committee be continued from year to year, it will develop many accurate observers, who will have a definite knowledge of the subjects concerning which information is sought.

Committee: { H. L. HUTT, J. HOYES PANTON, JAS. ATKINSON.

INDEX.

REPORT

OF THE

COMMISSION OF INQUIRY

AS TO THE

ONTARIO AGRICULTURAL COLLEGE

AND

EXPERIMENTAL FARM

1893.

(*DISTRIBUTED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.*)

PRINTED BY ORDER OF THE LEGISLATIVE ASSEMBLY

TORONTO:
PRINTED BY WARWICK & SONS, 68 AND 70 FRONT STREET WEST.
1893.

THE COMMISSION.

The Great Seal of the Province of Ontario.

GEORGE A. KIRKPATRICK,
Lieutenant-Governor.

PROVINCE OF ONTARIO,

VICTORIA, by the Grace of God, of the United Kingdom of Great Britain and Ireland, QUEEN, Defender of the Faith, etc., etc., etc.

To John Winchester, of the City of Toronto, in the County of York, Esquire, Master in Chambers; John Watterworth, of the Village of Wardsville, in the County of Middlesex, Esquire, and John S. Pearce, of the City of London, in the said County of Middlesex, Esquire, our Commissioners in this behalf, Greeting:

C. F. FRASER, Attorney-General, *pro tempore*, R.S.O., Cap. 13, Sec. 3.

WHEREAS, in and by Chapter seventeen of the Revised Statutes of Our Province of Ontario, entitled, "*An Act respecting Inquiries concerning Public Matters*," it is enacted that whenever the Lieutenant-Governor of Our said Province in Council deems it expedient to cause inquiry to be made into and concerning any matter connected with the good Government of Our said Province, or the conduct of any part of the public business thereof, or the administration of justice therein, and such enquiry is not regulated by any special law, the Lieutenant-Governor may, by the Commission in the case, confer upon the Commissioners or persons by whom such inquiry is to be conducted, the power of summoning before them any party or witnesses, and of requiring them to give evidence upon oath, orally or in writing (or on solemn affirmation if they be parties entitled to affirm in civil matters), and to produce such documents and things as such Commissioners deem requisite to the full investigation of the matters into which they are appointed to examine, and that the Commissioners shall then have the same power to enforce the attendance of such witnesses, and to compel them to give evidence, and to compel them to produce documents and things, as is vested in any Court in civil cases; but that no party or witness shall be compelled to answer any question by his answer to which he might render himself liable to criminal prosecution.

AND WHEREAS it has been made to appear to the Executive Government of Our said Province that it is expedient to inquire into the want of harmony said to prevail in the Agricultural College and Experimental Farm at the City of Guelph amongst the staff, officers and others connected with the said institution, or some of them, and into the conduct of said persons so far as the Commissioners may deem the interests of the institution to require.

AND WHEREAS the Lieutenant-Governor of Our said Province of Ontario in Council deems it expedient that inquiry should be made into the said matters,

NOW KNOW YE, that we, having and reposing full trust and confidence in you the said John Winchester, John Watterworth and John S. Pearce, do hereby, by and with the advice of Our Executive Council of Our said Province, appoint you the said John Winchester, John Watterworth and John S. Pearce, to be Our

Commissioners in this behalf, to inquire into and report to Our said Lieutenant-Governor upon the want of harmony said to prevail in the Agricultural College and Experimental Farm at the City of Guelph, amongst the staff, officers and others connected with the said institution, or some of them, and into the conduct of the said persons, so far as the Commissioners may deem the interests of the institution to require; giving to you Our said Commissioners full power and authority to summon before you any party or witnesses, and to require him or them to give evidence on oath, orally or in writing (or on solemn affirmation if such party or witnesses is or are entitled to affirm in civil matters), and to produce to you, Our said Commissioners, such documents and things as you may deem requisite to the full investigation of the premises, together with all and every other power and authority in the said Act mentioned and authorized to be by us conferred on any Commissioner appointed by authority or in pursuance thereof.

AND WE DO REQUIRE you, Our said Commissioners, forthwith after the conclusion of such inquiry, to make full report to Our said Lieutenant-Governor touching the said investigation, together with all or any evidence taken by you concerning the same.

TO HAVE, HOLD AND ENJOY the said office and authority of Commissioners for and during the pleasure of Our said Lieutenant-Governor.

IN TESTIMONY WHEREOF we have caused these letters to be made patent, and the Great Seal of Our said Province of Ontario to be hereunto affixed.

WITNESS: The Honorable George Airey Kirkpatrick, member of Our Privy Council for Canada, etc., etc., etc., Lieutenant-Governor of Our said Province of Ontario, at Our Government House, in Our City of Toronto, in Our said Province, this eighth day of June, in the year of Our Lord one thousand eight hundred and ninety-three, and in the fifty-sixth year of Our Reign.

By command,

(Signed), J. M. GIBSON,
Secretary.

REPORT

OF THE

COMMISSION OF INQUIRY

AS TO THE

AGRICULTURAL COLLEGE AND EXPERIMENTAL FARM,

GUELPH, ONTARIO.

To the Honorable GEORGE AIREY KIRKPATRICK,
Lieutenant-Governor of the Province of Ontario:

MAY IT PLEASE YOUR HONOR,

We, the undersigned Commissioners appointed to inquire into and report upon the want of harmony said to prevail in the Agricultural College and Experimental Farm at the City of Guelph amongst the staff, officers and others connected with the said institution, or some of them, and into the conduct of the said persons, so far as the interests of the institution required, beg to report as follows:

During the inquiry, which commenced on the 15th June and ended on the 6th July, 1893, your Commissioners examined 94 persons in all, of whom 64 were students of the College, 12 ex-students, 12 officers, and of the remaining 6, 5 had previously been connected with the institution.

The petition asking for the investigation, presented by five ex-students, namely, R. N. Morgan, of Strathroy; W. L. Carlyle, of Chesterville; D. Buchanan, of Toronto; F. Mulholland, Yorkville, and W. Rendall, of Camperdown, states as follows: "Speaking on behalf of the great body of graduates of the Ontario Agricultural College, we recognize that you have done much in the interests of agricultural education, especially in the equipment of this institution. We certainly owe our gratitude to the present Minister of Agriculture for the many improvements he has made during his tenure of office, some of which are the establishment of the Dairy School and the erection of new buildings. The College is a great power for good in our Province and elsewhere, and has vast possibilities, but we regret to say that it has not done and is not doing what it might. Why? It is well known that there is something seriously wrong which has long existed and cannot exist much longer. Unless speedily corrected, it must result disastrously."

"The existing state of affairs is causing comments through the country unfavorable to the institution; has kept students away from the College, and has a most injurious effect upon the character of the students during their course."

The evidence taken shows that there existed a lack of harmony between Dr. Mills, President of the College, and Mr. Shaw, Professor of Agriculture. A large number of witnesses alleged that such lack of harmony was occasioned by the actions of the President.

It was also alleged by Professor Shaw and some of the students and ex-students of the College, to whom he had repeated his supposed grievances, that there was a lack of harmony between the Minister of Agriculture and himself.

Your Commissioners respectfully beg to refer to the instances of lack of harmony which the witnesses laid most stress upon as causing the trouble. In addition, your Commissioners respectfully beg to refer to the conduct of such of the officers and students as, in their opinion, the interests of the institution require.

With respect to the lack of harmony which it was claimed was occasioned by the actions of Dr. Mills, President of the College, the following are instances:

INSTANCES GIVEN BY PROFESSOR SHAW.

He states that the second night he spent in Guelph he had friction with the President, in consequence of being assigned a room with the President's secretary, which he was to share with the secretary as his bedroom and study, he supposed. He felt grieved at being thus treated. The next day, he said, Prof. Robertson offered to share his bedroom and sitting-room, and he accepted the offer.

In answer to the above charge Dr. Mills stated:

"I had received no order at all to furnish him rooms. I am not under obligation to furnish rooms for every one at the College. Afterwards, Mr. Drury consented that I should do so. He thought it would be more convenient, and I agreed with that. That was before Prof. Shaw's wife and family came. He wished to come into the College, and I was willing to do the best I could; but had received no orders to provide him with rooms. The College is, properly, for boarding students. Prof. Panton had two rooms, Prof. Robertson two and my secretary one. Prof. Shaw was coming only for a short time, and I did not think it was wise to go to the expense of painting, papering and carpeting rooms for him, so I fitted up a bed, etc., and put it in the room occupied by my secretary. I thought that was quite satisfactory to him, and never knew different until he complained now.

"I heard his wife was coming to visit him. I said I would like to entertain her during her stay; and he accepted the invitation. When she was to come, I sent my carriage down to the station to meet her and bring her up. I afterwards found that there was another carriage to meet her; she was taken somewhere else and nothing was ever said to me. We had tea waiting. There was never any explanation. She was taken to the College and kept in the matron's apartments by Mrs. Martin.

"I spoke to Prof. Shaw afterwards about taking his wife away after accepting my invitation; he simply listened to what I said, and made no explanation whatever.

"I treated him as well as I knew how."

ANOTHER INSTANCE. Parker was weighing cattle by order of Story, and when doing so, Dr. Mills told him there was no necessity for it; that he might be better employed doing some other thing. Mr. Story told him this.

As to this, Dr. Mills gave the following evidence:

"About the weighing of cattle. Prof. Shaw had his farm and the Journal both on hand the first year he was here, and, with my consent, he went down occasionally to his own farm. Several complaints had been made that Parker was neglecting the sheep and that they were not regularly watered. The Minister told me it was my duty to go around and see whether there was any truth in these statements. I went around one afternoon and found a stock ram that evidently had not had any food or drink for some time. Prof. Shaw was away at his farm, and I did not know where Story was. I asked Parker if he had been fed. He said he got something in the morning. I asked when he was watered: he said 'yesterday afternoon.' I asked him his excuse for his neglect. He said he had received an order from Prof. Shaw or Mr. Story to weigh cattle. I said to him, 'Do you mean to say they intended you to neglect the cattle?' and ordered him to go and water them and then attend to the weighing."

ANOTHER INSTANCE. "Milk was being drawn to the dairy school in February last. We had some horses that were unused and idle. One Sunday evening the President sent Mr. Hay over to say that he would like a horse, I think he said the following morning, to draw milk. We let one of the horses go. Shortly after, I went over to talk of the matter with the President, and represented to him that the horses that were idle were not prepared for that kind of work and were liable to injury, even by a single day's work in that condition. So far as I remember, he said that it was the Minister's desire that we should furnish a horse—I believe two days in the week—as one of the horses in regular work was not in a very good condition. I remonstrated that the horses were not ready for work and that it would injure them. As he rather insisted on having it done, I said, 'Very well; if it is the Minister's will and your will, all right.'

One of the horses was put on the road, and, the end of the first or second night he came home sick, and was in the doctor's hands for quite a while."

In answer to the above, the following evidence was given:

Dr. Mills stated: "Prof. Dean and I agreed that I was to try to get the supply of milk for the school. We were using two travelling dairy teams for that purpose. We had considerable difficulty in getting the milk, and the roads were bad. One of the horses gave out. There were a number of horses in the stable doing little or nothing at that time. I did not think it right to go and hire a horse while there were lots there. Prof. Shaw did not seem to like the idea, when I said that I would like a horse to replace the one that was sick. I did not know what horse was sent, till I found that 'Old Fred,' an old, heavy, road horse had been sent—a horse that no man in his senses would think of sending for such work—he was played out."

"There were four or five horses idle at that time—if not absolutely idle they had very little to do—the experimental teams had little to do. I spoke to Prof. Shaw about them. He said that Benson, the driver, had objected to either of these horses going out on the work, and that he rather approved of his course."

Mr. Story, being examined as to above, stated:

A. He was a good horse—he was not a driving horse—they asked for him.

Q. Who?

A. I think it was Palmer.

Mr. MILLS—They did not ask for him.

Mr. WINCHESTER: Q. Would you yourself have put such a horse to such work?

A. No.

Q. Then, why did you send him?

A. They took him in spite of me.

Q. Who?

A. Teamster Bell, I think.

Q. Who asked for "Fred?"

A. Bell said Dr. Mills said we were to give him a horse. I said, you can have your choice of "Fred" or "Doctor";—the other horses were all working.

Q. Would you send that horse for that purpose?

A. No.

Q. Did you do it intentionally?

A. No; I said, "You take that horse to the dairy and change it for the one running around the road. He is not in a condition to work."

ANOTHER INSTANCE: With reference to the difficulty about the student labor, on April 14th last, the Minister wrote to the President, in which the following appears:

"I desire also to call your attention to the fact that I have struck out the extra item in the estimates for student labor; and I wish it distinctly understood, that so long as any person is a student at the institution, he shall be required to take the ordinary run of work and be paid therefor in the ordinary way in which students are paid, and in that way only. In my judgment it is not in the interest of the institution that special jobs should be given, or paid for, out of the funds of the institution—except in special instances that have been submitted to yourself, or to this department, and approved of. When some students are employed as hired men, receiving higher wages than the others, we are liable to severe criticism, on the ground that one student is receiving an advantage over another—which, certainly, cannot be defended."

This letter was immediately submitted to Prof. Shaw. After reading it, it appears that he informed some students, who were enquiring about the matter, that whatever they earned must go on next year's board.

In his evidence, Prof. Shaw states that when he received the letter from the President, he read it hurriedly, and, as he afterwards learned, put a wrong construction upon it, when the boys asked him about wages.

In his examination the following takes place:

Q. But is not the letter perfectly plain?

A. I just read it hurriedly; and just laid it aside, thinking I would copy it shortly and observe it more exactly.

Q. But after Findlay pointed out to you that your statement was inconsistent with the letter, you still held that you were right?

A. I do not think Findlay pointed it out to me.

Q. You showed that letter to him—the very part.

A. I did not read it.

Q. But he did, and told you you were wrong; how can you account for that inconsistency? At any rate you went to the President and settled the matter, and asked him to announce it the next morning—which he did. You were a little late; he did not wait, but announced it, was that it?

A. Yes.

Mr. MILLS, in his evidence as to above, stated:

Q. There was some statement about crediting the students for labor at the end of the term—what is your explanation of it?

A. In several instances they came to me asking if it was true that if they had anything to their credit at the end of the year it would not be refunded. They did not say from whom they came, nor from where they got the information. Ferguson came and said he wanted to know for certain about the matter. I told him it was entirely incorrect—I had given no order, and was not aware that the Minister had. Mr. Comfort also came and I told him the same thing. Then Prof. Shaw and Mr. High came to me. High had been to me before to know whether he might be excused from work; I said he would have to see Prof. Shaw, as I could not interfere with Prof. Shaw's plans. I told them that there was nothing in the report. No one said who had circulated the report. Prof. Shaw asked me to make it clear to the students the next morning. I had, on several occasions, intended to speak about it, but had forgotten. Next morning I thought I would make the statement at once, in case I should forget it again. Prof. Shaw was a little later than usual. I said: "Someone is circulating falsehoods in regard to the work, and that I could not account for it." I say now they were falsehoods. Prof. Shaw came in as I was finishing the announcement. He afterwards came to my office and said it was he who had made the statements to the students, and that he had misunderstood the letter. He did not state that before.

ANOTHER INSTANCE—September 26th, 1891: "Dr. Mills being responsible for the Creamery Department, there was corn lying on the ground belonging to the department, from September 19th to October 10th, and partly spoiled. People seeing it would naturally come to the conclusion that it was the fault of the farm foreman, over whom I am responsible."

As to the above Dr. Mills stated:

Q. What about the Dairy Department cutting corn?

A. I did not cut it; it is under Prof. Dean; I finally did send a note to him about it, and he attended to it. I think it was to some extent spoiled. Prof. Dean complained that he had only one horse and could not get the farm to do the work. The farm objected because they thought they were doing work for which they were not getting credit. This matter has since been brought up before the Board who decided that the farm must do the work, and items were put in the estimates last spring to cover the expense attached to this. Last year Prof. Dean could not get the farm to do anything. He hired horses in the city at $3 per day and did his own work.

ANOTHER INSTANCE was about a student named Wells.

Prof SHAW: "I told the students after the close of the College that we would expect them to work regularly; that we would not put up with them coming when it suited them and staying away when it suited them, and that if they did not work regularly their names would be removed from the list. Wells absented himself and I removed his name from the list. The President called my atten-

tion to the fact that he was off the list, and said that unless he got work he must go home. I conferred with the President and intimated to him that we did not want to put Wells on the work list. Some time after he went home." This was in August, 1890.

ANOTHER INSTANCE: About a month after his appointment, having to wind up his business as journalist and not being prepared for his duties, he wrote for two days getting up tables of farm work, and the third day he was preparing his lecture, when the President asked him to go down to the barns, "and my time was so taken up to within a few minutes of going in to give my lecture."

ANOTHER INSTANCE was on October 12th, 1891. "I received a memo. from Dr. Mills to send at once, if possible, the number of pens, etc., of the proposed piggery, size of passage, etc. What I complain of is the great number of demands from Dr. Mills for things at once."

ANOTHER INSTANCE: "On May 13th, 1891, I received a note from the President stating that the milk, instead of being brought to the College as soon as it was drawn, was allowed to stand in the foul air until it became tainted and spoiled for keeping. That occurred only one single morning—when the note arrived."

ANOTHER INSTANCE I shall mention as a grievance, is in reference to accounts in which President Mills stated that there were a large number of accounts in the books without the details. When I came to examine the orders the items were in these. There were some slight omissions. I do not say these were all the omissions he had reference to; I do not think they were.

ANOTHER INSTANCE: On May 28th, 1890, Mr. Story refused to let any of the 2nd year students go to the Experimental Dairy in the afternoon, as desired by Dr. Mills. I am satisfied that Mr. Story did not refuse to let them go, but that they required some little time to make up the work list before the change could be satisfactorily made. In connection with that President Mills sent in the following memo., in which one or two things were said that were not called for:

MEMO. *Re* STUDENT DISTRIBUTION.

May 28th, 1890.

Another deputation of 2nd year students waited on me to-day, and informed me that Mr. Story has positively refused to let one of them go to the Experimental Dairy every afternoon as requested. I am sorry for this. I think the request is a proper and reasonable one; and I shall be obliged if Prof. Shaw will arrange this matter at once so that they may begin to-day.

We must all bear several things in mind: First, that the students are here not for what work we can get out of them, but to learn what they can; and we are bound to give them every possible facility for instruction.

Second, that the farm is not the only department of the institution. It is entitled to its share of student labor, but nothing more.

Third, that the staff of hired help in every department, including the farm, is, I think, about sufficient to do the work in first-class state without any student help; so there cannot be much ground for complaint under this head.

I do not want anything unreasonable; but if the proposed arrangement is not satisfactory we shall have to go back to the old plan whereby the President distributed the students to the several departments.

JAMES MILLS.

ANOTHER INSTANCE was at the first annual supper that took place after his appointment. Mrs. Martin asked him before going in if he would come in with her. He did so and sat down at the head of one of the tables near where President Mills was sitting. The President said something to him about changing his place, and asked Mrs. Martin to excuse him, when she replied that she would not do so—he was taking care of her that night.

With reference to this instance Dr. Mills gave the following evidence:

Q. What about Prof. Shaw's grievance in connection with the experimental dinner?

A. He got into the Martin ring; when the dinner time came, he, Mrs. Martin and Mr. Hunt, together with some guests that Mrs. Martin had invited on her own responsibility (although it was the custom for me to give the invitations) came in and went to a different table. There was an officer's table and I have always had the Professor of Agriculture on my right on those occasions. I did not know anything about it till everyone looked around—it looked as if I were setting them aside. I went to Prof. Shaw in order to right matters and asked him to take his place at my table. He said he would not do anything of the kind, and stayed where he was.

ANOTHER INSTANCE—December 15, 1891: There is a letter from Dr. Mills wherein he asks to have it arranged for a supply of milk before Prof. Shaw leaves the College for Lansing. "That was just made before the College closed for three or four weeks. It would have made it very awkward for us if we had gone and purchased cows at that time, and we would have had the milk on our hands. We arranged for a supply of milk as soon as the College opened again."

As to the above Dr. Mills stated:

Q. What about the supply of milk for the College?

A. The matron complained very frequently that it was insufficient.

Q. What about the number of students falling from 100 to 50 at Christmas?

A. It is not correct—the falling off is usually at Easter.

Q. Is there any difficulty in the distribution of surplus milk?

A. Not if there is any effort made. We had the creamery all along, and when that quit we had the dairy.

Mr. SHAW: I referred to the four weeks holidays.

Mr. WINCHESTER: Would all go away then?

Mr. MILLS: It usually falls to about 20 during that time.

ANOTHER INSTANCE: "In the autumn when the College opened Dr. Mills wished us to begin morning lectures to the students on feeding. I considered that we were not ready for doing so, because the machinery had not been put in. We did not get the lectures until the machinery was put in. He should not have insisted upon the lectures."

As to the above instance Dr. Mills gave the following evidence:

Q. Did you interfere with him about lectures to the students in the cattle stable?

A. Soon after Mr. Drury came into office he expressed the wish that there should be as much practical instruction as possible given directly to the students in the stables. I therefore asked Dr. Grenside to come to the College in the mornings in the fall, and that I would send the students to him to lecture to them there upon the care of horses, etc. That was carried out. I then asked Prof. Shaw in as kindly a way as I knew how to get the same kind of thing started in the cattle stables, but one reason or another was given against it. I then wanted the cattlemen to do it, but could not get it done, although the students wanted the instruction.

ANOTHER INSTANCE: "Dr. Mills has complained to me sometimes about weeds growing on certain portions of the farm, when I thought there was very little occasion for such complaint, and when weeds were growing at a far greater rate and in far greater numbers in the Horticultural Department."

With reference to the above Dr. Mills stated: "This occurred the second day before the picnic, about June 20th. I happened to go around as I sometimes do, and saw quite a lot of mustard, and I thought it had escaped Prof. Shaw's notice. I knew he was anxious to keep the farm clean and have it look well to visitors. I took notice of the things I saw that needed attention and sent a memo. of them to Prof. Shaw. This was in 1890. Soon after that Prof. Shaw wrote to the Minister without my knowledge, making the charge against me and the Horticultural Department for weeds neglected there. Mr. Forsyth was head of the Horticultural Department till January last, but he was ill all last summer. He wanted to resign, but I did not want him to, as he had been an old and very faithful servant, and said I would keep an oversight of his department myself. His foreman was doing the best he could. I spoke to him about keeping the place clean for the very reason that Prof. Shaw said that visitors did not distinguish between the departments. He said that he would do his best. When Prof. Shaw made the complaint I went to the foreman again about it. He said: 'Prof. Shaw has made a charge against me; go and look into the farm field and you will find plenty of thistles' I went and found the thistles ready to seed. I said, 'well, that is no matter; you clean yours.'"

ANOTHER INSTANCE is that I was told by a member of my family that Captain Clarke had asked my son, who is lame, to ride up with him from Guelph and that he had come with him a couple of times; that he noticed young Mr. Mills carry a note to Captain Clarke, and that after he handed him that note young Mr Mills rode up with him instead."

As to the above instance, Prof. Shaw in his evidence stated as follows:

Q. You do not believe Captain Clarke got a note from Dr. Mills asking him to take his son instead of your own?

A. I said I was told it.

Q. Did you believe it?

A. I am inclined to think Dr. Mills did not.

Q. When did you change your mind?

A. Since the investigation began

Q. When?

A. Since Dr. Mills stated it here.

Q. And still the miserable thing was working in your heart?

A. That was in my mind until the time I told you.

Captain Clarke, upon being examined upon the subject, stated as follows: "I drive to the College at 4 o'clock from the city and Edgar Mills and Willie Shaw were at school, and usually they came out with me. Young Shaw is lame, but he drives the horse to the Collegiate, and if Mills is not kept in he will drive it to the College and drives it back to the station and leaves it."

Q. You have heard of Dr. Mills writing to you and that as a consequence you have not taken Prof. Shaw's son?

A. I have heard now but not before.

Q. What do you say about it?

A. I never heard a word about it in my life. He never wrote to me. I never had a letter from Dr. Mills nor Prof. Shaw nor his boys.

Q. They are friendly boys?

A. They would go for one another. It was young Mills that first suggested taking Willie Shaw.

Q. They are so friendly as that?

A. I thought so. I picked young Shaw up. It was young Mills suggested it. Dr. Mills has never spoken to me in the fourteen years I have been here about anyone.

ANOTHER INSTANCE—October 18th, 1891: "There was a note sent by Dr. Mills saying that the swill had not been removed that day, and that if I was not able to attend to it regularly he would attend to it himself. I thought that discourteous, for the day that happened was the day of the sale when there were some hundreds of people here, and everyone in our department is so occupied that they would not be able to attend to it, as on other days."

ANOTHER INSTANCE: "In February, 1892, the Advisory Board sent for me to confer with me about my horse being kept in the President's stable. Some members asked me to go over and look at the stable. We went over and the conclusion was, while we were talking together, that there was no room for my horse and conveyance. I said I would take the conveyance if necessary to the farm shed some distance away. The Board said that they thought that a reasonable proposition. I had received some letters from Dr. Mills before that, the tenor of which was that there was a decided necessity for taking the horse away, while I looked on that as something there was not an absolute necessity for."

With reference to the above Dr. Mills stated as follows: "When that stable was built Prof. Brown was here. I consulted the Minister, Mr. Ross, and he said that building is to be only for the College horses proper; that is, the horse of the President and the Bursar. I said, what about Prof. Brown's horse? He said its place is in the farm stables where, he said, it could be looked after with the ordinary horses without extra cost, and when it is wanted there will always be the

cattleman or his assistant there to get him out. The horse that Prof. Brown had was bought by the Government; it has been presented to Mr Story. I never agreed to keep Prof. Shaw's horse when he came, but being willing to accommodate him I consented to put the horse and carriage for a time in the extra stall in my stable—the stall reserved for visitors. The carriage house is 22x28. I then had five vehicles there. At that time the waggonette was kept in the implement shed. There was a row about not running it often enough. The man had to drag it from the place down the hill up here to clean it, and when it was run more frequently we found that would not do so I had to put it in my stable. After that I bought a private cutter of my own. Then Prof. Shaw bought a cutter and we had the place packed full, so full that the carriages could not be kept clean, and the man complained. Then I ventured to suggest to Prof. Shaw the propriety of keeping his horse in the farm stables. He did not take any action and finally wrote me that he would not do it. I understood that he afterwards wrote to Mr. Awrey complaining of the matter. I then laid the matter before the Board and it was decided that Prof. Shaw should make some addition to the waggon shed for his accommodation, which he never did."

ANOTHER INSTANCE is that of a camera for which a monthly requisition was made out on July 12th, 1892. The facts respecting this instance of lack of harmony complained of by Prof. Shaw, and in reference to which he says he got one or two letters from Dr. Mills that he thinks were not courteous, the facts solicited from the examination of Mr. Zavitz, Prof. Shaw and Dr. Mills are as follows:

In the monthly requisition from the Experimental Department, dated July 12th, 1892, order for the month ending August 15th, there was inserted "a camera, $60." This requisition appears to have been handed in about July 15th. Such requisitions were handed in on the 15th of each month by the heads of the different departments for the approval of the President under the by-laws. Section 7 of the by-laws stating the duties of the Professor of Agriculture, states as follows: "He shall make requisitions for purchases required for the outside departments, laying such requisitions for approval before the President, and shall make such purchases when authorized."

Upon receiving this requisition, the President struck out the item "camera $60," and at the foot of the requisition made the following memo: "Would like to consult with someone about camera as I do not find it in the year's estimates, and from what Mr. Crealy tells me, it may be possible to get a good one for half the money."—J. M.

This requisition and memorandum was handed out and Prof. Shaw saw it, and after seeing it, told Mr. Zavitz, his assistant or experimentalist, to go on and buy the camera and that he need not say anything to Dr. Mills about it.

On September 19th Prof. Shaw writes Dr. Mills, in which the following appears:

"In your letter of August 12th, bearing upon the purchase of a camera, you say, 'write no more,' but the nature of the statements therein are of such a character that in justice to my department I cannot let them pass unanswered. I waited until the requisition for the Experimental Department for the month ending 15th September was returned to me before writing a reply. This I received only yesterday, and not until I had asked for it two or three times. I wished to ascertain whether the item for the camera was interfered with again, and as it is not I will now see to it, since its purchase is sanctioned in a regular way, that it is bought, though it will be of little or no use to us this season.

"Most emphatically do I say the '13th July' was early enough for the purchase of the camera. We wanted it when sketching grain plots when ripening or ripe, which would not be until the end of July, We knew where to purchase it, and simply had to order it when sanctioned.

"You complain of lack of consultation. Wherein should there be any necessity for further consultation about a matter like this? You were consulted when the estimates were handed to you by us about the first of February last, with the item 'camera' specially mentioned, and also the probable cost, viz.: $60. Why should we consult any more about it at a time when a hundred things were pressing for attention at once? Why should you attempt under the circumstances to humiliate me by striking out that item at such a time from the requisition? What was to be gained by further consultation? Mr. Zavitz and I were certainly in a position to know what we wanted better than one not directly engaged in the work. It is very proper that I should advise with you when necessity calls for it; nay, I will not only be willing but anxious to do so, but a man of your good judgment must see, if you will but consider, that the desire for consultation may easily be carried too far. Now, I look upon your driving the pen through that item on the requisition in the way in which you did as quite unnecessary, unkind and indefensible.

"Mr. Zavitz certainly did the right thing in not purchasing the camera after it had been struck off the requisition, until he was authorized by me to do so, notwithstanding anything that might be said to him by anyone else.

"I cannot let your statement pass that I went to Hamilton without letting you know. You know that I went not for holidays, but to seek quiet, where my broken shoulder would heal. I went two or three times to your office to say to you that the doctor had ordered me to go to a quiet place, but you were not in; and I asked Mrs. Shaw to go over and tell you the day I left, which you know very well she did."

In his evidence Prof. Shaw states:

Q. Mr. Zavitz explained that the President told him to purchase it after you returned home in July?

A. Yes, late in July.

Q. And you would not allow him to purchase it?

A. A short time afterwards Mr. Zavitz, going through the College hall, saw Dr. Mills, who called him into his office and said he wished to speak to him about the camera. He stated that there was a very good camera that one of the students had, and asked if that would be sufficient. "I examined it and found it was not. He said, all right, then, that was all he wanted, and gave me liberty to buy a camera." Prof. Shaw had previously instructed him to buy it. Mr. Zavitz thought he would go on and get the camera. About that time Prof. Shaw met with an accident and on the 23rd of July went to Hamilton. On July 20 Dr. Mills told Mr. Zavitz that he might purchase such a camera as he thought proper. As soon as Prof. Shaw arrived at Hamilton, he directed his sister, with whom he was stopping, to write Mr. Zavitz as follows: "Please do not purchase camera in the meantime." Having received such letter, Mr. Zavitz did nothing further in the purchase.

On July 28th, Prof. Shaw writes Mr. Zavitz, in which he states as follows: "Enclosed find copy of the letter I have sent to the President; it is a holiday present. Will send him a couple more when I return. If he asks you about

camera do not authorize anything; say to him that I cancelled the order given to buy in consequence of his note to me, and that I have no authority since to advise." On the same day he wrote Dr. Mills the following letter:

GUELPH, 28th July, 1892.

DEAR MR. MILLS,—In a monthly requisition sent by me to you on the 12th inst., I inserted an item of $60 for the purchase of a camera. When you returned the same to me with your signature, this item had been struck out. You mentioned at the same time, in a foot-note on the said document, that you "do not find it (the item) in the year's estimates." In reference to this I desire to say:

1. That this item was inserted in a copy of our estimates forwarded to the Minister of Agriculture through you last winter. I not only handed this document to you myself, but I saw the same document afterwards in the office of the Minister of Agriculture, Toronto, after the estimates had been accepted by him, and this item was not then struck out. In fact, he passed this item in my presence when we were looking over the experimental estimates together at that time.

2 That we wanted this camera to take sketches of the experimental grain plots while the grain was ripening, and for other kindred purposes, that we might be enabled more effectually to give useful information to the farmers of this province. I would like to know, therefore, when we may expect it. The season is too far advanced now to use it for many of the plots, and I may say further that I positively refuse to be held responsible for the consequences of the delay.

3. I desire to say further that it was the intention of Mr. Zavitz and myself to purchase a camera as economically as we could, having a careful eye at the same time to the efficiency of the instrument.

4. That while I am well aware that a camera can be purchased for $10, I am satisfied that one costing considerably more even would be of no use for our purpose. I cannot consent to have an inferior instrument of this nature used in our departments of the experiment work. It would not be in the interests of the institution to have it so.

I greatly regret the delay that has arisen.

Respectfully yours,

THOMAS SHAW.

To which Dr. Mills replied, on August 1st, 1892, as follows:

Aug. 1, 1892.

DEAR PROF. SHAW,—I have just received your letter about the purchase of a camera for the Experimental Department, and in reply I beg to say: First, your June requisition was not sent to me till nearly a month after the proper time, and exactly *six days* thereafter I happened to meet Mr. Zavitz; and, after asking him some questions about the matter of a camera and hearing what he said, I

told him to go and purchase what he wanted *without delay*. I think the *13th of July* was not the time to submit a requisition for a camera which should have been purchased in April or May. The purchase should have been made a month and a half before the requisition was submitted, and it was perfectly plain that the instrument would be needed in June; so the blame for delay rests somewhere else than in my office.

Secondly, I never suggested the purchase of a ten dollar instrument. I think Mr. Zavitz is and has been negotiating for a camera somewhere in the States.

Yours very truly.

JAMES MILLS.

THOS. SHAW, Esq.,
Prof. of Agriculture,
Hamilton, Ont.

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After returning to Guelph and learning from Mr. Zavitz what Dr. Mills had said about the camera, he stated that it was unfair for Dr. Mills to give Mr. Zavitz orders or something of that kind. He then sent the following letter to Dr. Mills:

GUELPH, 9th Aug., 1892.

DEAR MR. MILLS,—Your letter of the 1st inst., addressed to Hamilton, has just reached me. You say therein our June requisition was not sent you until nearly a month after the proper time. When I handed the said requisition to Mrs. Mills in your absence, I wished her to say to you that, owing to the rush of picnics and excursions to the Farm, and the accident that came upon me and laid me aside for several weeks, I had failed to hand you the requisition at the proper time, and not until the date mentioned; and I do think these reasons should be considered valid under the circumstances. But I fail to see why you refer to the June requisition at all, as we did not ask for a camera when that requisition was sent in. We asked for it in the July requisition, which was handed to you on the 12th of that month. This was soon enough for our purpose, as Mr. Zavitz had been making inquiry previously at my suggestion, and received estimates for a camera which we could have purchased and had on hand in ample time to answer our purpose, had the requisition not been returned to us by you with the item scored off altogether, although it had been inserted in the estimates months before.

The camera was wanted, in the first place, to sketch certain grains when ripe, and therefore, in my judgment, was asked for sufficiently early. But since it has been struck off the requisition, and, in consequence, is not purchased yet, I beg to remind you that I consider the usefulness of our work, more especially in reference to the preparation of our next annual report, has been seriously hindered, and for this I again disclaim all responsibility.

You speak of having given instructions to Mr. Zavitz at a certain date to purchase a camera. You will allow me to say here that I deem it unfair and unjust to me for you to give positive instructions to anyone in my department without any knowledge on my part that such instructions had been given.

Truly yours,

THOMAS SHAW.

On the 12th Dr. Mills wrote Prof. Shaw as follows:

GUELPH, Aug. 12, 1892.

DEAR PROF. SHAW,—I have just received your letter of the 9th *re* camera; and I must say that it greatly surprises me.

First, Prof. Shaw's requisition for a camera reached me on the *13th of July*. Now, does Prof. Shaw or any other intelligent man mean to say that this date was the proper or anything like the proper, time to hand in a requisition for the purchase of a camera for use in taking views of plots of wheat, etc., grown this season?

Secondly, when the requisition was returned to Professor Shaw I wrote on it that I would like to consult about the price before any purchase was made; and Prof. Shaw, although passing my office almost immediately thereafter, did not come in to consult about it. Instead of doing so he went away to Hamilton and wrote me a fault-finding letter about the matter, charging me with causing great delay which would involve very serious consequences, for which he would not be responsible.

Thirdly, I had heard, and Prof. Shaw now says that it was Mr. Zavitz who was negotiating for the purchase of a camera; so knowing this fact, and Prof. Shaw having gone away without consulting about the matter—even without my knowledge of his leaving—I took the earliest opportunity to ask Mr. Zavitz some questions about the kind of instrument which they wanted, and the price which it would be necessary to pay; and having heard what he said, I told him that they might proceed at once and purchase such an instrument as they had been negotiating for. This occurred exactly *six days* after Prof. Shaw's requisition was handed to me. I gave Mr. Zavitz no "positive instructions," as Prof. Shaw well knows; but Prof. Shaw having left for his holidays without giving me an opportunity to consult about the matter, and even without my knowledge, I simply told Mr. Zavitz that he might go on at once and purchase as Prof. Shaw had directed him—that I was satisfied. This occurred on the 20th of July, and it is now the 12th of August—23 days after. Now, if so much could have been done in six days from the 13th of July, why is it that nothing has been done in the 23 days immediately thereafter? Prof. Shaw says Mr. Zavitz, by his order, had done the negotiations before the 13th of July. Why, then, has the purchase not yet been made? Simply because Prof. Shaw, as I well know, resents the very idea of having to consult me about any purchase or sale; and because I asked for consultation in this case he is bound, if possible, to make trouble out of it. Hence he has taken no steps towards the purchase. He has even stopped Mr. Zavitz from doing so.

Yours truly,

JAMES MILLS.

THOS. SHAW, Esq.,
Prof. of Agriculture,
Hamilton, Ont.

In his evidence Prof. Shaw stated as follows:

Q. Why was it not purchased when permission was given?

A. Because it was of no use to us at that late day.

Q. Did you direct him to purchase it in November?

A. There was no special necessity for purchasing it in July because the time had gone for what we wanted it.

Q. Was the time gone by when the President told Mr. Zavitz to purchase it?

A. I do not know when that was.

Q. Mr. Zavitz said it was before you went to Hamilton. Did you write to tell Mr. Zavitz not to purchase it?

A. I do not remember. The camera was not bought until, I think, November.

Q. Do you know why the President wrote the note on the requisition?

A. He said it was not in the estimates, but it was.

Q. Could you not have told him that?

A. That everlasting consultation was what I resisted. I had agreed to submit requisitions, not to consult him about every little thing.

Q. On June 8, the Minister wrote referring to your letter of April 25, in which you say that submitting the requisitions would possibly be only a matter of form, and he replied that he would hold the President responsible; and yet you say the President had no business to enquire at all.

Letter to Mr. Zavitz of July 23 produced.

Q. Did you send this to Mr. Zavitz?

A. That is not my writing.

Q. Did you send that letter?

A. I imagine it was sent by my direction. There has been no serious trouble about the requisitions since then.

CONDUCT OF PRESIDENT MILLS.

David Buchanan, ex-student and agent for the Canada Live Stock Journal, in his evidence stated that when a student he signed a petition for the removal of Mrs. Martin, and also one for the removal of Mr. Hunt. That he noticed a lack of harmony existing between the President and Professors Shaw, Robertson and Hunt. Mr. Hunt told him this year that he found two years after he came here that the President was not a true man. The main trouble was the character of the President; that he is an untruthful man.

Q. Now, give us some instances ?

A. These wranglings were going on in the President's office and at the Experimental Union Supper, the President made a statement that he never saw a time when the institution was so flourishing and so harmonious as now.

Q. What other instances ?

A. In the summer of 1891 while I was attending Prof. Shaw's horse, there was a hydrant broken in the grounds. Dr. Mills said to me, "How did you break that tap ?" I said "I did not, Mr. Mills." He said, "I know you did. John told me you did." I said to John when I saw him, "Did you tell the President I broke that tap ?" He said, "No. I have not spoken to the President to-day at all."

W. J. PALMER: "During my previous term I had heard there was a lack of harmony, more especially between the President and Professor Brown. I could not specify any cases. I understood it was on account of Professor Brown's lack of management."

Q. Was there any truth in the rumor ?

A. Yes, decidedly: his carelessness was obvious to all. He told me a few things about the disagreement he had this spring with Professor Shaw. I can hardly call them disagreements. They were little matters. One was in connection with the boys driving up in the rig. I understood that Professor Shaw had misunderstood him entirely in that. The other was that Professor Shaw did not think he had enough money for the farm and blamed the President for it to a certain extent. I was not here as a student. I was in charge of the travelling dairy school. I never heard these things mentioned while I was a student. I think he said he had heard that Mr Sharman had been communicating with the students during the McCrae trouble.

C. A. McFIE: "I think that the announcement the President made about the work was an instance of lack of harmony, partly from the manner in which the President made the announcement. In the first place he did not wait till Professor Shaw came in. This suggested itself to my mind as one of the reasons. Soule told me that while Mrs. Craig was away on her holidays last spring two pigs were put into her bedroom; that Mrs. Craig complained to the President and that the matter was never investigated. Mr. Newman went and laid the matter before Dr. Mills to have McCrae removed; the petition was drawn up to ask him hand in his resignation. The President thought that the action the students had taken was a little too severe, and he told us that in consultation with the Minister he had suggested an investigation be made. I think Sharman said that the President did not leave a correct impression on the minds of the investigators. The first day they met the students the investigators were talking of the various witnesses, and how the students stood—the satisfied and the dissatisfied, and the President stated that it was hard to tell where the third year were. Some one communicated that to Mr. Sharman."

Q. Did the third year men complain of Mr. McCrae ?

A. They took some interest in it.

Q. Were they taking lectures from him ?

A. The majority were not.

J. J. FERGUSON: "The President told me that he as President was in duty bound to support as far as possible any officer in connection with the institution. This remark was made in connection with the McCrae trouble."

K. MCNAUGHTON: "I worked for the President last summer, and one day we passed where the painters were painting the fence. I think the President said it was foolish to put so much money on the fence—that the paint cost as much as the fence in the first place. He said the painting would not make the fence more durable. I think that showed a want of harmony between himself and Professor Shaw."

Mr. SHARMAN: Had conversations with Professor Hunt about the affairs here with special reference to the relation existing between President Mills and Professor Shaw. "He (Mr. Hunt) had not a very high idea of Mr. Mills. He was of the opinion that if an investigation were held it would be found that the reason of the lack of harmony would be attached to President Mills, and that the result of such investigation would lead to the removal of President Mills. I disagreed with him as he said it, both in his estimate and his result. He considered Mr. Tytler would fill the position of President of the College."

C. A. ZAVITZ: "Not very long ago I heard President Mills said Professor Shaw would never be controlled by any man—would be a very hard man to control or words to that effect." "He said that he thought Professor Shaw usually stretched things out pretty well—was always trying to put the bright side out and that he thought he was hardly justified in some of the statements that is specially in regard to some of the lambs. The President said something like this—Professor Shaw said they paid and by adding the value of the manure, they did, but if you left out the manure they did not, and no farmer would ever think of putting in the value of the manure."

PROFESSOR SHUTTLEWORTH: "The President told me on one occasion that if Professor Shaw would do less, and be on the farm more, a better state of things would exist. There were a lot of accounts on his table at the time; he seemed to be in difficulty with them."

W. L. CARLYLE: "Once went into Mrs. Craig's (the Matron) room and found her crying. She said she had been insulted—she had been getting new wash basins and pitchers and went down to the President to know what she was to do with the old ones. He was busy at the time and did not answer the question; the second time he looked up impatiently and said 'Put them behind your bed.' She turned and left. I spoke about this, and the pigs being in her room to the students. Mr. Hunt told me that both he and Professor Robertson left here through lack of harmony; that Professor Robertson would never have left here if things were running right. Professor Robertson is getting a larger salary and under a better government. Hunt advised us to go on with the investigation. He wanted the matter investigated. He told us it was among the students and ex-students. I know of nothing against Dr. Mills that he should be dismissed for. I never said I did. I never said that I knew things about him, that if I chose to speak out would prevent him being President. Hunt said he left through not being able to get along with the President; he said he was not allowed to manage the students in the way he would like to."

J. A. B. SLEIGHTHOLM stated: "The President spoke disparagingly to me of Professor Shaw and Mr. Hunt. He thought they were not pulling into line

with him as they should. He only spoke to me once that I can remember. What he spoke to me has not been mentioned by me till to-day to anyone. The occasion of the conversation was when I went to the President for a donation to the Y. M. C. A. He very kindly gave it to me. It was in the spring of 1891. We were talking about the suggestion to place bible study on the College programme, and there was some feeling at the President refusing to do so. I believe he was in sympathy with us. The President stated his reasons, and that was what led to the reference to Mr. Hunt."

ARCHD. PARKER, Herdsman for fifteen years: "One time when I was feeding mangels the President told me it was not the proper time of the year for mangels. Mr. Story gave me instructions to feed them; it was in October before the turnips came in. The spring was the proper time. We could not get anything else. I told Mr. Story that the President had told me to stop feeding them. Mr. Story told me that I was to feed them, and I did so."

Dr. MILLS, as to this, said: "I never told Parker not to feed mangels—I know better than that. I asked him why he was doing so at that time of the year, as I did not think it was the best time—I never told him not to feed them."

Prof. JAMES W. ROBERTSON was Professor of Dairying at the College in 1886 and was reappointed in the fall of 1887. Remained until February, 1890, and was then appointed at Ottawa. The only reason for leaving was that the new appointment gave him a larger field for his work. No reason at the College. He stated that there was no reason that he should leave through lack of harmony. Shortly after Prof. Shaw came there was some difference of opinion between the President and him. The impression left on his mind was that the Professor knew or imagined that he was interfered with in the management of his department by the President. He stated that there were two or three occasions of difficulty between himself and the President, through acts of discipline. They were all reported to Hon. Mr. Drury at the time, and enquired into, and disposed of by Mr. Drury. They were cases of students misbehaving, and Mrs. Martin's dismissal. He only wanted the defects remedied, and had nothing against President Mills personally. He stated, "I think he (President Mills) cares for the welfare of the College." He believed that he had been misrepresented to the Minister in the matter of building the silo, and thought he had been unfairly treated by the President without knowing exactly what the President had stated. The matters mentioned in his letters caused him to feel strongly against the President's administration. He stated, "I have a good deal of admiration for Mr. Mills' ability and for much of his work. I would not like to have it thought that I have any hostility towards him. I think he is an able man and is doing good work. I think the members of the staff were dissatisfied with the President's administration in the ways referred to." He adds, "In my relations with the President I never found it impracticable to get my work well done. There were certain things I did not approve of—matters of college discipline mainly. In my relations with the President I had no fault other than those I have stated in these cases."

J. E. STORY, Farm Foreman: "President Mills called me into his office about a year and a half ago and stated that the Minister had said he wanted the lane through the centre of the farm finished. He said something about Prof. Shaw writing to newspapers, and that it would be better if he would mind the work here and let newspaper writing alone."

JAMES MCINTOSH, Mechanical Foreman for the last twenty years: "The President has given me orders direct ever since he has been here until the last

year. Shortly after the President came, certain work was required about the water pipes. He told me to leave my own work and attend to it. I told him I could not do so without Prof. Brown's instructions. I went to Prof. Brown and told him all the circumstances. Prof. Brown told me that would never do; that I could not leave the students to attend to this work. The Professor of Agriculture should have given me the instruction. We were moving old buildings at one time, and there was a wall to be thrown down. The farm foreman, the Professor of Agriculture and myself went to see how we could do it. It was after the first fire. There was a floor there that had been fitted up temporarily. Mr. Story said that it could be lifted successfully after it thawed out. I got a note from the President written in this manner: 'I want that floor removed immediately.' Of course I attended to the instructions of the Professor of Agriculture. I wrote on the note and sent it back, that Mr. Brown did not want the floor removed immediately. I think that one time under Mr Shaw there was a little trouble. Mr. Shaw gave me instructions to repair one of the water valves. I went down to attend to it and the President came along with me, and we consulted as to how we could do it. The President thought it better to open the drain. I thought that would be a very expensive way and proposed to flush it out, which I did, and repaired it. He seemed to be well satisfied. He wanted the others done similarly. I examined them and did not see anything they wanted. I said that I would have to see Prof. Shaw about it, and went and told him that the President wanted them fixed. The President was there waiting me again. I said Mr. Shaw told me not to fix them if they did not want fixing."

As to this evidence, Dr. Mills states:

"There has been but one carpenter, McIntosh, for the whole institution, and, for some reason, he was placed under the control of the farm department. The consequence was, that when I wanted work done I had to go to the head of the department; and then await the convenience of the carpenter. Prof. Brown recognized this difficulty; and there was an arrangement between us that I could give my orders directly to the carpenter and that he would do the work as soon as possible, without interfering with his farm work. Things remained that way till Prof. Shaw came, when he very soon gave the carpenter positive orders not to do anything for the President without a direct order from him. On one occasion a door broke and I wanted some staples driven I went to Mr. McIntosh with the staples in my hand and asked him to assist me to drive them in, as I could not do so alone. He said, very curtly, that he would not—that Prof. Shaw had given him orders that he was not to do so without his order. If I sent a written order to Prof. Shaw, saw him personally, and waited till it suited the carpenter's convenience. I could get work done, but in no other way."

Mr. Sharman, in his evidence, gave the following instances of lack of harmony on the part of the President with members of the College staff. He stated:

(1) President Mills and the former Professor of Agriculture were not on good terms. As to this Dr. Mills, in his evidence, states that he was the only one who wrote a strong letter in behalf of Prof. Brown when he resigned.

(2) The President said that Prof. Dean would have to go to work and do something to make a vast improvement in his English or give up his position. As to this Dr. Mills states that he is particular about English. Prof. Dean had been somewhat careless about it. He was engaged cutting up the Professor's report when Sharman entered, and the Doctor remarked that he was sorry some of the graduates did not write better than they did, and that he thought Prof. Dean was careless about his English; that he could do better if he liked. He never said he would have to leave or anything of that kind.

(3) Also said that the Minister of Agriculture considered that Prof. Robertson was a man of but few ideas, whose work was made up principally of a repetition of those ideas under a variety of forms. As to this Dr. Mills states that he and Sharman were talking over some papers at the Dairymen's Convention. He said that he had come to the conclusion that even the greatest of men sometimes repeated themselves and instanced Mr. Dryden, and said that he had frequently complained of this but consoled himself by remembering that even Prof. Robertson often repeated his speeches.

(4) He said Prof. Hunt's successor must not engage in the side shows in which Prof. Hunt had engaged, that is, referring to his divinity studies and preaching.

(5) With reference to Prof. Panton, he said that the Minister was of opinion, and he was of opinion himself, that Prof. Panton would be much better engaged in scientific investigations and experiments than in running off to Yellowstone Park and the Mammoth Cave in summer, and that the Professor said very little about high blood and breeding—was inclined to disparage them—until he married a person who was a relative of President Harrison, when he made a great deal of the family lineage, and so on. As to the first part Dr. Mills said he was not reflecting upon anyone. Prof. Panton had been a man true as steel and thoroughly loyal to the institution. "I said that the Minister was anxious that all the departments should do as much original work as possible, that Prof. Grenside should make some investigation in the tape worm matter, and said he would like Prof. Panton to devote his spare time to purely scientific work in connection with his department because it would be better for the College than any general information he might gain by visiting any noted caves or parks. I said I thought the Minister was right in that. He has been doing this since. It was stated by Sharman that I reflected on Mrs. Panton. Nothing could be more false or further from my intentions. Mrs. Panton is one of the first ladies in this country, known intimately to myself and friends. I never conveyed the idea that she was a woman of low breeding. I did laughingly say that Prof. Panton was talking a great deal about the high lineage of the American lady whom he was about to marry. That is the whole story."

(6) Said that the public generally were ridiculing one of Prof. Shaw's bulletins, and that that ridicule was justified in his mind as Prof. Shaw made those lambs produce manure which in its total value would be more than the total value of the feed given.

(7) In October, 1892, he said that the Minister of Agriculture told him that Prof. Shaw, at an Institute meeting, had gone about amongst those in the meeting to get them to pass a resolution asking him to write the bulletin on a certain subject. That the men in the meeting did not of their own free will and choice make that request. Said that Prof. Shaw wished to write a bulletin in that instance antagonistical to the Minister's wishes, and to effect that end he undertook to get the meeting to request him to write the bulletin.

(8) "During the month that the position of assistant resident master was vacant—October, 1892—President Mills had offered me the position, at least, had said he would recommend me for the position. I had gone to him once or twice towards the end of the month. I went to his house one evening. He showed me a letter from the Minister and told me that Prof. Shaw would have to be put out of his position and gave me his reasons, showing me the letter asking him to ask me if I would take the position of Professor of Agriculture. In the letter was written, 'Don't let the matter out.' The President told me the position of Professor of Agriculture was a better one than that of Resident Master. He told

the conditions on which the position would be given to me and the salary. He told me that the new Professor of Agriculture would have nothing whatever to do with the farm; purely Lecturer on Agriculture at $1,200 a year. He told me what his estimate of me was and what the Minister's estimate of me was. He said I was a worthy young man in the Minister's estimation, and a coming young man." As to the above Dr. Mills made the following statement:—

"In October last I was driving the Minister to the station and he said to me that he thought Prof. Shaw intended to resign. He said 'I am not sure whether he has any situation in view or not, but I understand that he is telling the students that he intends to leave.' He said 'if he does leave I will divide the department; I will appoint a lecturer in agriculture and a farm superintendent who will devote his whole time to the farm.' But he told me to say nothing about it as it might not be true. Before then I had recommended Mr. Sharman for the position of assistant resident master. I was anxious that the vacancy should be filled. I again repeated my recommendation and urged the Minister to make an appointment. In reply he wrote me a short note saying he had made up his mind whom he would appoint to the position. He said there might possibly be a vacancy in the agricultural department but he was not sure and, if so, he had thought of utilizing Sharman's services in connection with that department. (He had asked me my opinion of Sharman if the vacancy should occur.) Then he said I was not to say anything about it, except that I might communicate the matter to Mr. Sharman, giving as his reason that it might be untrue that Prof. Shaw was going to leave. He did not talk of removing Prof. Shaw either in the conversation or in the letter. . . . I said 'I do not know whether there is to be a vacancy or not, but that if there should be I intimated what Mr. Dryden had said regarding him and that this would be a better position than that of resident master.'"

(9) He also spoke to me about the foreman of the Horticultural Department, Mr. Forsyth. In substance he said that he was an old fogy and would have to be replaced by a man of more advanced ideas, more vigor. The next morning Mr. Sharman made the following explanation of this statement: "With reference to the evidence of last evening I would like to say that the President was watering flowers one night about dusk and said he had to do it at that time without the knowledge of Mr. Forsyth; that he (Forsyth) had an idea if it was done in the hot season the roots would be burned up, and the President said that was one of his old fogy ideas." As to this Dr. Mills stated he never called Mr. Forsyth an old fogy and gave the same explanation of what took place as Mr. Sharman made subsequent to his examination in chief, and added: "Mr. Forsyth was kept here by me all last summer, although he wanted to resign, because I knew him to be one of the most trusty men about the institution and a most faithful servant in every respect. He resigned eventually because his health was entirely used up and he could no longer attend to his duties."

Dr. MILLS, in answer to the charges against him, states as follows:

"Prof. Shaw was not here any time hardly till he began a very persistent and determined agitation for a change of the Christmas vacation. It was without consulting me, and the Minister said, without consulting him. All he said was in my hearing one day in the reception room, that he intended to have the vacation changed. He talked to the students—and to nearly everybody he met—at least, so everyone told me.

I had the Christmas vacation changed for the institute meetings. There were formerly two weeks at Christmas and two weeks at Easter. After you took out the little time that must go to the Professors at Christmas, there was no time

for the institutes. I saw we were not reaching the farmers at all; and laid the matter before Mr. Wood and suggested some change—he did not seem to care to take it up. When his successor, Mr. Ross, came into office, I laid the matter before him; and he thought it was a good suggestion. We agreed to add the Christmas vacation to the Easter vacation, that being the time when farmers are most free to attend the meetings. Allowing the professors a day or two, we then had about three weeks for this work. The small number of meetings we then had has now increased to about a hundred.

Prof. Shaw went to the Executive Committee of the Central Farmer's Institute and got them to bring in a recommendation to the meeting to vote that our vacation in this College be changed, although they admitted they knew nothing about the matter, only that Prof. Shaw recommended it. The Secretary and two other members of the Committee told me. It was with a view to bring pressure to bear upon the Minister and myself. He talked to everyone about the thing and Mr. Hunt took it up in his letter, in his behalf—that is the letter signed 'Dreamer,' in which he made it appear that he was a farmer—which I answered in the Report of 1890.

As to the charge about my not making any investigation into the matter of the pigs in the matron's room:

The matron was away on her vacation. Mr. Sharman, acting for Mr. Hunt, was in charge of the College building. Towards the end of the vacation, I was away for a day or two on some business. During my absence, some person or persons one night brought a couple of small suckling pigs from the farm buildings and put them in the matron's bedroom. I understand that the engineer found them the next morning and took them out. I was annoyed about the matter, and enquired around to see if I could get any particulars with a view to a general enquiry, but could not, as the students would not tell on each other. I at once had the carpet in the matron's room taken up and a new one put down and the room washed, etc. When she returned, she was very much annoyed, as she naturally would be. We talked it over. I said it was an outrage, and that I would do my best to find out who had done it, but I expected we would have some difficulty in doing so.

I said there were two ways—one, to appoint a royal commission to enquire into it; but I said there is also another way, that is, to keep perfectly quiet and say nothing about what is going to be done, and the parties, thinking it past, may let it out. We agreed to do this and to await results. After a time, she came to me and said she had heard a student in the hall say: 'pig, pig'—it was Wooley; and she also named two others she suspected. I called the three and questioned them as closely as a lawyer could have done, but they said they had nothing to do with it, and did not know who had. I told the matron to continue to watch for a clue. Sharman made no report to me, although he was in charge. I met him one day and asked him if he had any clue and he said he had not.

There was the matter about the basins. There were tin basins in the students' rooms, and we decided to replace them with crockery ones. I was very busy, and the matron came to me to know where she would put the basins. I said 'put them behind your bed.' She took it up in earnest, and I went after her to her room and said 'surely you do not think I meant that.' I said I should not have said it and that I did not mean anything by it."

Q. You have heard the evidence of the witnesses as to what Prof. Shaw told them that you and the Minister were interfering in his department, that is, in refusing to give third year students work.

A. It is not true that we were interfering. I do not interfere. When the third

year clause was brought up, I inserted in the catalogue a clause to the effect that all third year students would do one and a half hours' labor. We soon found that this was impossible, owing to the heavy third year work. Last July or August, I revised the circular for 1893, and suggested to the Minister that this clause be struck out as we were not insisting upon it. This was accordingly done without reference to any of the departments.

In June, the students came to me wanting work. I said we can give you no work as students, but that Prof. Shaw had some permanent improvement on hand, and if he needs help, and is willing to give you employment, I shall have no objection, but you will be paid as though independent of the institution. I believe that Mr. Bell was the only one to get work and, Prof. Shaw, he said, told him that the President and Minister were trying to interfere with his department.

Q. I understand that Prof. Shaw attributed to you the reason why the by-laws were not revised by Hon. Mr. Drury ?

A. I say that is unjust. I never wrote or said the least word in intimation that they should not be revised. I once wrote to Mr. Drury, stating that if he intended to revise the by-laws I wished he would do so.

I have allowed Prof. Shaw altogether too much latitude—more than any other officer of the institution—he was a very short time here until I saw that if I insisted on my position as laid down in the by-laws, there would be war to the knife. I saw it at the first from the coldness which I could not account for, which was apparent the second night. Then his protest against the by-laws and against all authority. Then he paid little attention to the suggestions I made.

Q. Did you consult with him at all ?

A. Yes, certainly.

Q. Was your tone peremptory ?

A. It was the same to him as to everyone else.

Q. Mr. Hunt, Mr. Buchanan and Prof. Shaw have stated that they believe the Minister is controlled by you ?

A. I think many of these men have found out how easy it is to control the Minister. It is not true. From the time Prof. Shaw came here, I saw that he was a suspicious man and that the Minister was taking a wrong course in allowing him to violate the by-laws and pass by me. The Minister thought he could manage Prof Shaw better than I could, and I stood aside and let him try. Knowing this to be the case, I avoided discussing Prof. Shaw or his department at all. I asked to be excused when asked to do so. I did not even discharge my ordinary duties respecting things I should have reported. It was said I manipulated the estimates—I did not. I did not see the camera in his estimates because I never went over his estimates. I never went over the farm estimates, excepting when Prof. Shaw was present, and that was once in the Rossin House. I deny that I poisoned the Minister's mind against any of them.

Q. Prof. Shaw said you did not notify him about the picnic.

A. It was the first this June. I went down to Toronto on the evening of 12th to attend the closing exercises and present the graduates. A day or two before that Prof. Shaw came to me and spoke about this picnic, objecting to their

driving out from Freelton and hitching their horses around. I agreed with him, but thought we would have to let it go. He knew the picnic was to come, although he complained that he was not officially notified. When in Toronto I telephoned Putnam to tell Prof. Shaw to take charge of the picnic in my absence, as I could not be there.

The boys were behind in English. I saw they were not ready for the examination, and I said if they would come I would give them a lecture in the evening. I then asked if there was anything to hinder them from coming the next evening. They said "no," and I went for several evenings. I did not know till this examination that I was interfering with Prof. Shaw.

Q. Did Prof. Shaw have more lectures than his predecessor?

A. No, the ordinary lectures; but after Prof. Shaw came the third year was added, and there was one a week extra.

A. I was building the piggery under the direction of the Public Works Department when Prof. Shaw came. I properly had charge of the work, but I associated Prof. Shaw in it and made some changes under his direction. As regards any offensive order, I have no recollection of it. I say that Prof. Shaw was extremely sensitive of his authority and position, and it was almost impossible for me to give him an order that he would not take offence at. For a time I gave orders orally, but did not get any attention paid to them. At the time the grounds around the buildings were in a very bad state, and the yards around the piggery were only partly finished. This was so for nearly two years. I appealed to Prof. Shaw to attend to the matter—I asked and asked—but it was of no use. He said "yes," but did nothing. Neither could Mr. Drury get it done. The whole lower side of the farm was a disgrace. I did not want to do it because it was not in my department. Mr. Dryden did the same till he was going away in 1890, when he came to me and said: "I have asked Prof. Shaw to have these matters put right till I am tired; and I have asked you. It is a disgrace to the institution, and has been so for two years. Ask Prof. Shaw once more, and if he does not do it you are to immediately employ hands and get it attended to. If you do not do it I will put someone else there who will." I again asked Prof. Shaw, but he took no action, so I employed men and did all the work myself—built pig yards, built fences and graded the road, gravelled around the building and finished it up. As soon as Mr. Dryden came back Prof. Shaw made a charge against me for interfering with his work.

A. I frequently cancel fines I have imposed myself if I find them unjust; but I hardly ever remit fines imposed by another unless that person recommends it. Occasionally I do remit a portion if it is excessive. I never remitted any for Kennedy.

Q. What about the painting of the fences you objected to?

A. In what I said I never thought of reflecting on Prof. Shaw, but more on myself. Prof. Shaw wanted to put up a hedge, but was desired to put up a fence. I had since found that the cost of painting the fence was so great that I was beginning to consider whether it was a wise thing to do. It was rather a reflection on myself. I said it might do to whitewash them; but it would not pay to build such fences and paint them.

It is correct that Prof. Shaw arranged with me to meet the students. That morning I had to go to the dairy on some business and came back, as I thought,

in time. I came around the back of the building, and when I arrived I saw the students just going off the walk in front of the College building on their way to the dairy. I was perhaps two minutes late. That was this June.

Q. What about this work ?

A. The boys complained that they had not enough instruction in the practical work, but Prof. Shaw has not applied for more help so far as I am aware.

Q. You wrote to Ferguson on that question ?

A. Yes.

Mr. WINCHESTER to Prof. Shaw : How did that letter get in your diary ?

Prof. SHAW : I think Ferguson told me that he had received a letter from Dr. Mills and wanted me to see it so that I would understand about the whole affair.

Q. For what purpose did you make the entry ? You say, "The President asked for a written statement: they began at once to see the hand of the ensnarer." What did you mean by that ?

A. We understand who live here.

Q. What did you mean by it ?

A. I meant that Dr. Mills is a very cunning man, good at laying plans, seeing a long way ahead.

Q. But you had some reason for these words ?

A. I cannot give them all just now.

Q. You had some reason at that time ?

A. I cannot tell you all I meant by it. I have told you something.

Q. Why did you put it there ?

A. Because the transaction related to me.

Q. Did the "ensnaring" part relate to you ?

A. I could not see any necessity in the President asking for the written statement.

Q. But you were not the President ? They were trying to get rid of something on the curriculum.

A. Not all of them. We had a meeting the night before and the whole matter was fully talked over. I think Mr. Atkinson was not present, but it was generally understood that he was likely to get one of the medals, and if the plowing examination was held it might influence the whole result. I met the whole class except Mr. Atkinson, and I think Mr. Spencer. They agreed that they would like to get the instruction. I went over the whole ground and explained the difficulty in giving instruction. I put the question and they decided that they would rather dispense with the examination that year. I had an interview with the President next night. Atkinson was present and objected to the arrangement, and said that a number of the boys were of the same mind. I felt from the first that if there was a single dissenting voice, it would not be right to set aside the examination ; and I so expressed myself to the President. All who were there agreed to that, and that should have ended the matter.

Dr. MILLS: After the meeting Ferguson and McCallum came to me and spoke strongly about the matter. I said I would see Prof. Shaw again. He happened to drop into my office after that and we made certain definite arrangements. I had not time to communicate the facts to the boys after our conversation: but when I got to Toronto I wrote this note to Ferguson.

Q. Why did you require this statement?
A. That I might have something definite to act on.

Prof. SHAW: I can give you another reason for my statement: Because I believed that Dr. Mills was trying to get occasion to write about me in reference to that.

By Mr. WINCHESTER to Prof. SHAW: What had you to do with it?
Prof. SHAW: I was certainly concerned in that examination. I felt he was wanting to get occasion to send a letter to the Department.

Q. Did he ever do that?
A. I would like him examined on oath about that.

Q. Did he ever do that?
A. Yes, I believe he did; I am not sure that I can prove it.

Q. Do you think it honest for one Professor to use such language against another?
A. Yes.

To Dr. MILLS: Did you ever write or get up anything to complain of to any of the Ministers about Prof. Shaw?
A. I did not; I swear it.

To Dr. MILLS: What about Kennedy's name being struck off?
A. It was not reported to me.

Q. Did not Story report it?
A. He did not.

A. Prof Shaw has as much help to give instruction in plowing as his predecessor had, but there is less instruction given. So far as I am aware Prof. Shaw has never applied for help or horses and been refused by me.

Re CONDUCT OF PROF. SHAW.

THOMAS SHAW, Professor of Agriculture, stated in his evidence as follows:
Saw the by-laws of the College and Farm about two weeks after he came to the College. Was appointed September, 1888. These by-laws set forth the different duties of the different officers connected with the College. About March 10th, 1889, at a sale of his own stock, he purchased, through a friend of his named Williamson, two breeding cows for the Agricultural College, notwithstanding the by-laws prohibiting any employé of the College or Farm from purchasing anything from himself for the Government. Although the purchase was made in the name of Williamson, Prof. Shaw obtained the purchase money. He

made no report of the fact to the Minister, but on April 16th, 1889, Hon. Mr. Drury having ascertained the fact, wrote to him as follows:

"In reference to the purchase of cattle, I desire to point out that it was a most ill-judged action on your part to purchase these animals at your own sale, in the name of another party. I greatly regret that you should have placed yourself in such a position. I do not charge you with any wrong-doing, but I am bound to say that it was an action that will not bear investigation, in view of the fact that it was done in opposition to the expressed wishes of the Advisory Board, in which I concurred and in which you also agreed, and against the express and established provisions of the by-laws in that behalf. I think you will agree with me that it was a transaction that might be considered a grave reflection on your own reputation. I trust that nothing of this character will ever again occur. I venture to predict that these animals will cost very much more to raise that to purchase for the purpose mentioned by you."

To which Prof. Shaw replied, on April 18, as follows:

"I beg to acknowledge yours of 16th inst. In reference to the purchase of cattle at my sale, although they were knocked down to a bidder at only a dollar or so more than the other men bid, I agree with you to the full extent that it was 'ill-judged action on my part.' A thousand times since I have reproached myself for it before you made reference to the matter at all, and I would now forfeit a great deal if that would undo it. You need have no apprehension of such a thing ever happening in my lifetime again. I may say this, however, that I think I was influenced to do so by some purchases having been made from me after my appointment and prior to my assuming my duties here. However, I have no desire to defend the transaction in the aspect of it which relates to the animals having come from my own herd, and, since you called my attention to the matter in your last letter in so explicit and open a way, I find a sense of relief in the opportunity thus given me of declaring my views to you on the subject."

With reference to the statement in Prof. Shaw's letter, "I may say this, however, that I was influenced to do so by some purchases having been made from me after my appointment and before assuming my duties here." Dr. Mills, in his evidence, states as follows: "I was requested by Mr. Drury to visit the exhibitions that fall and buy a certain number of sheep and some cattle, etc. I went to the Toronto Exhibition, and, after consultation with different parties, I purchased some sheep. I went to Hamilton, and, after spending a couple of days there, I purchased a sow and a steer belonging to Mr. Shaw. When the bill came in it occurred to me that it might look as though there was something wrong, and said he had better put it is his foreman's name, owing to the clause in the by-laws forbidding buying from officers. But I did not consider he was an officer then. It was accordingly put in that way. He became an officer of the institution on October 1st. I bought the stock some time in September. Regarding the purchase of Prof. Shaw's own stock by himself, he never consulted me, and I knew nothing about it till after the cattle were here."

Travelling Expenses.

It is part of the duty of the professors to deliver lectures during the month of January in each year at Farmers' Institutes, they being attended by other persons, who assist them. The travelling expenses of the three are paid by the Government. In January, 1893, Prof. Shaw, with Messrs. Hutt and Jackson, took division No. 1. At the expiration of the trip Prof. Shaw returned the amount of the expenses paid by him, he being chairman, at the sum of $164.10. For the same number of men and days in the previous year, Mr John I. Hobson returned travelling expenses at $114 being a difference of $50.

It is true that Prof. Shaw had two more places to lecture at than Mr. Hobson had, but there was only one at which lectures were given, Tara being skipped. It is also true that there were five occasions when livery was hired by Prof. Shaw. For hotel bills, livery and 'busses the charges in the account rendered by Prof. Shaw exceeded the actual amount paid, or proper to be paid, by some $40. He stated that this sum was expended by him in postage (he stating that he wrote at least ten letters a day while away), stationery, hot lemonade, shaving for two, and perhaps luncheon and dinner for some farmers who were invited by them for dinner. He can only mention two cases where he invited farmers for dinner with him, namely, Hensall and another place which he did not remember, and he could not remember the number present.

It appears that he left the delegation on January 10th for Columbus, Ohio, where he delivered addresses, and did not return until 13th. He received some $25 and expenses for the addresses from the Ohio people. During his absence he paid Mr. Buchanan's travelling expenses for three days, which was charged and allowed as proper.

Notwithstanding his statement that he wrote some ten letters a day during his absence, upon the production of his diary it was shown that from the time he started until he left for Ohio he was constantly writing on his addresses to be delivered at Ohio, and, after his return, he daily wrote articles for the press, so that his statement as to the number of letters he wrote and the stationery purchased is, no doubt, incorrect.

The delegation commenced lectures on January 3rd and ended on 21st. They were away two Sundays between these dates, and Prof. Shaw was in Columbus three days—that is five days from the nineteen set apart for the work, or fourteen days in all, during which Prof. Shaw charged $40 more than he actually paid for hotel, 'bus and livery expenses.

Mr. Buchanan, in his examination, swore that from December 23rd, 1892, to January 23rd, 1893, he was travelling from Toronto to Hensall, from Hensall to London, then joined the delegation on January 3rd, and continued with them, except two days, during their tour. That he paid his own expenses during all the time he was absent—railway, hotel and 'bus (excepting the three days he took Prof. Shaw's place and the week he was at home between December 23rd and January 1, and two days that he stopped with farmers). His total expenses during all that time were $35, and he considered that he expended more than he frequently did, and that others should have travelled as cheaply as he did. Mr Buchanan was a witness for Prof. Shaw, and did all he could to assist him during the investigation, even going so far as to go to the district travelled for the purpose of interviewing the hotel-keepers as to the amount paid by Prof. Shaw.

Prof. Shaw stated that he kept the expenses on slips of paper made out by him every three or four days, and that he acted carelessly in so doing. This is rather singular when it was admitted by him at the time that he not only kept a diary of every day's work, but also a private cash-book and a record book, in which he entered matters in connection with the College. In his examination he admitted that he had done wrong in not keeping a proper account of his expenses. He admitted that the account was the largest one that had ever been paid in that division since the institute work started, but that he could not account for that, that he was negligent, and that the statement might not be absolutely correct every day.

In his examination the following took place:

Q. So there was an overcharge of about $40 during these fifteen or twenty days?
A. Excuse me, it was not an overcharge.

Q. I say it is an overcharge, and I say it advisedly, and it is for you to explain it. I have your accounts, and you have sworn to the statement being true, and you cannot account for it. Now, it is a serious thing for you, more serious possibly than you think, and you cannot account for it?
A. No, sir.

Q. And that is your only answer?
A. I cannot account for it other than in the ways I have accounted for it

He also added:
"In the account blanks there are only spaces for railway fares, telegrams car fares, hotel bills and meals. I always included meals, with one exception in the hotel bill, because there was no other space for it."

He states that he read the by-laws about three weeks after coming to the College, and about November, 1888, he told President Mills that several of the clauses of the by-laws relating to his duties were so exacting that he thought he could not live under them, and that he intended to ask the Minister to have them modified. The clauses he referred to were as follows:

Section 2. "He shall, with the approval of the President, plan all farm, mechanical and experimental operations, and see that such plans are carried out when approved." The part that be objected to was planning in detail.

In the next section he objected to the consultation requested with the President: "3. He shall, subject to the approval of the President, prescribe the daily time to be devoted by the foreman and employés in each department, and shall lay down the daily duties of each foreman."

He objected to the first part of section 5: "The farm superintendent shall, when authorized by the President, sell any live stock, farm produce, or other articles appertaining to the farm." He objected to consultation with the President about selling all kinds of stock.

He objected to the last clause of section 6: "He shall also, with the approval of the President, prescribe the course and method of practical instruction and the time to be devoted by the students to the different departments of outside work."

He objected to the whole of section 7: "He shall make requisitions for purchases for the outside department, laying such requisitions for approval before the President, and shall make such purchases when authorized."

He objected to the second clause of section 10, as follows: "He shall, regarding those departments, carry out all orders made and instructions given by the President or the Commissioner."

Dr. Mills informed him that he had no objection to his laying the matter before the Minister, and he accordingly did so. On 26th February, 1889, he wrote to Mr. Drury, asking for some change in the by-laws relating to his position and duties, setting out the same objections to them as he had previously mentioned to Dr. Mills, and asking that the objectionable clauses be so modified,

as far as they related to the outside work of his department, that he should be responsible to the Minister alone. Not having received any reply from the Minister, he wrote again to him on March 11th, asking for an early and favorable consideration of the change of the by-laws, as requested by him, and on April 9th the Minister wrote him the following letter :

TORONTO, April 9th, 1889.

DEAR SIR,—I desire to discuss with you two or three matters which have recently come under my observation. This I should have done before leaving Guelph last Friday morning, had an opportunity presented itself.

First, in reference to the engagement of Mr. Carruthers as instructor. You will remember the occasion of our meeting at the Rossin House, when we were looking at the plans of the new buildings, and when you casually remarked that you were corresponding with a party in reference to this appointment, that I then desired you to proceed no further in the matter until you could consider the application of Mr. Cuppage. Subsequently, at the College, I directed you to make no engagement with any one until you had the opportunity of a personal interview with Mr. Cuppage, and I informed you that I had written to the gentleman in question, asking him to come to Guelph about the first of April for that purpose. Judge then of my surprise when, without a single line to myself or a conference with Mr. Cuppage, who had expressed himself willing to undertake the duties of the position, I find the first announcement of your plans in your statement that Mr. Carruthers is already at the College and located in one of the houses. In a letter which I received from Mr. Cuppage, sr., this morning he says that you wrote to his son enquiring if he were capable of giving instruction in the management of steam engines, and competent to teach plowing. He replied that all he knew of steam engines he had picked up while a student, and that he was competent to instruct in plowing. In view of the fact that others who had been on the farm in the capacity of instructor received instructions from the engineer, and that Mr. Cuppage professes to have some knowlede of engines, no doubt sufficient for the purpose, but that in the event of his requiring any assistance there is a competent engineer within easy call, I can come to no other conclusion than that the question of running the engine is a mere pretext.

I cannot account for this matter in any other way than that it is on your part a cool and deliberate attempt to set aside my wishes, and that your conduct in this regard is contrary to the letter and the spirit of the by-laws. It has placed me in a very awkward position in relation to the Cuppages, and I must confess that your conduct has greatly annoyed me. My object in asking Mr. Cuppage to call upon you was that you might yourself judge of his attainments, as I did not want to press upon you the services of an incompetent man. The fact that he is a graduate of the College gives him a stronger claim than a non-graduate. He is a young man of excellent character and of good education, and is fully equal, if not in many respects superior, to the man you have seen fit, contrary to my expressed wishes in the matter, to engage. It is possible that the course you have taken is the result of want of thought, but if I were to construe it as a deliberate insult to myself it could hardly be thought an extreme interpretation. No head of a Department can afford to be treated in such a way, nor do I propose for one moment to allow it in my case. You will, therefore, consider Mr. Carruthers appointment temporary until further orders.

Second. In last month's farm accounts there is an item for the price of three

head of cattle—two grades and one pure-bred heifer. When in Guelph last week I made it a point to inspect these animals. I believe you were present at a meeting of the Advisory Board when it was determined to make no purchase of stock, except under very urgent circumstances, until the farm produced feed for them, as we were obliged to buy feed at a high figure. I would like you, therefore, to explain to me why you thought it necessary to purchase this stock only a few weeks after we had sold every animal that could be spared in order that the expense of feeding might be saved. In the next place it was the decision of the Board, with whose opinion you fully concurred, that except in the case of milch cows, all animals brought upon the place should have good pedigrees. I am then to assume that you purchased these grade cows either for milking purposes or for breeding. No representations were ever made to me that it was necessary to purchase additional milch cows, and I am, therefore, compelled to believe that they were purchased for breeding purposes. I think it is a great mistake, and is falling into just the error that Mr. Brown made in his time. I should like to know what new light you obtained on the subject that induced you to change your opinion. This purchase is in direct contravention to the provisions of the by-laws, which set forth that no live stock, farm animals or agricultural implements shall be purchased until written authority has been obtained from the Minister.

Third. As I was about to leave the College on Friday morning I think I observed that the piggery near the wind-mill was being taken down. This building was erected only some three years since, the cost being, with subsequent expenditure for drainage, some $250 or $275. I enquired of the President, but he seemed to know nothing about it. On my way home I happened to meet Prof. Robertson at Cardwell Junction. I of course assumed that he would understand all about the matter, but he informed me that this was not the case. This greatly surprised me, because Mr. Robertson during a recent conference had outlined some experimental work in reference to the feeding of hogs in connection with the dairy, a sum of money being placed in the estimates for this purpose. If I should be mistaken as to what was going on, as I only observed from a distance, of course the circumstance will require no explanation.

Fourth. When in conversation with you in reference to the heating of your residence, you suggested that Mr. Angel might be employed to do the necessary work, and that someone be obtained to take his place if it should be required. I thought the suggestion to be an eminently sensible one, and in the interest of economy. On mentioning the matter to Mr. Mills, however, I learned that you had not discussed the question with him. As Mr. Angel is entirely under Mr. Mills' direction you should talk the matter over with him before communicating with the Department of Public Works.

I have not received one word of complaint from the President in reference to these matters, although I think it was his duty to have reported upon them. This is probably the result of what passed between us during our conference in the President's room two or three weeks since.

In conclusion, I beg to say that I desire to show you and all the other professors of the institution every consideration, and to render you all the assistance in my power in the discharge of your duties; but, on the other hand, I firmly insist upon due consideration being shown to me as the head of the Department.

I am now engaged in revising the by-laws with a view of giving you a a larger share of liberty in the management of the farm proper and of the live stock. My purpose is to submit the changes to the Executive Committee of the

Advisory Board. I have no doubt you will find it necessary closely to watch the expenditure. The accounts of last month are very heavy, and I must press upon you the necessity of exercising a very close scrutiny in this direction to prevent the possibility of the estimates being overdrawn.

I shall look for a letter of explanation in regard to the matters I have indicated at an early date.

Yours truly,

CHARLES DRURY,
Minister of Agriculture.

THOMAS SHAW, Esq.,
Professor of Agriculture,
Agricultural College,
Guelph, Ont.

On April 12th, Prof. Shaw answered the above letter as follows:

GUELPH, 12th April, 1889.

HON. CHARLES DRURY,
Minister of Agriculture, Toronto, Ont.

DEAR SIR,—Your letter of the 9th inst. is to hand, and I proceed at once to pen the explanation for which you ask in your closing paragraph.

First, with regard to the employment of Mr. Carruthers. When you called my attention to the matter in the Rossin House, a provisional engagement had been made with Mr. Carruthers, although at that time it was not formally closed. When you said at that time that you wished me to drop communication with Mr. Carruthers I regret that I did not point out to you that I had gone too far in my negotiations with him to retreat without dishonor, or without putting the blame on you, which would not be proper. I know Mr. Carruthers to be thoroughly competent, and I thought I should have the privilege of selecting subordinates for the various departments of my work; and I respectfully submit that it is in the best interests of the institution that I should have that privilege. This does not apply to the head of any department under me, but to the case of farm hands, including Farm Instructor, and this I trust will be conceded.

In my interview with you here last week, you will remember that it was proposed that Mr. Cuppage be given a place in the Experimental Department, which is certainly a far wider field than the other, and it was arranged with you that I should write to Mr. Cuppage as to whether he would accept the position, and upon what terms for six months, and I at once wrote to him accordingly. I then supposed that the matter was in a fair way of being arranged to your satisfaction.

Second, in reference to the cattle. They were not purchased till about March 1st, by which time I felt that it was certain that we had an abundance of food bought to bring us through. They will therefore be brought through with virtually no additional expenditure for food, and we will soon have more grass than we have of animals to eat it. I bought the two grades which are virtually purebreds in pedigree, for the purpose of raising fair specimens for review purposes when visitors call instead of buying them as heretofore. I felt it would be more creditable to the farm, and I think the animals bought are well adapted to the purpose, having both been first prize provincial winners last year.

Third, in reference to the piggery. The occasion of using the boards was this; After the fire the cattle were kept in the show grounds, a very unfit place in cold weather. There was urgent need of lining up the buildings. I understood from the President that the appropriations for the year were exhausted, and so on the urgency of the occasion used the boards. It is clear to me, however, that I overstepped my powers here, which, of course, I regret, Prof. Robertson not being here at the time. The only difference it makes is one of the labor of putting the boards on again, which we will do if you so desire. It will make no difference as to the amount of lumber to be purchased.

Fourth. As to my conversation with Mr. Angel about my putting a furnace in the house, you will remember, please, having instructed me (Mr. Mills, I think, being present) more than two weeks ago to go to Toronto and interview Mr. Tully. I certainly thought it unnecessary to interview Mr. Mills after you had so instructed me.

You make mention more than once to my having overstepped both the letter and spirit of the by-laws. I beg to remind you that while I desire to fulfil my engagement honorably and to the best of my ability, I really ought not to be bound by these by-laws, as I did not know of their existence when I made my engagement. I notice what you say in reference to their proposed revision, and must thank you for your consideration in this matter.

I also notice what you say in reference to the expenditure and will do all in my power to keep it within the estimates.

Hoping these explanations will prove satisfactory, I have the honor to be,

Yours very truly,

THOMAS SHAW.

In referring to the matters mentioned in the above letters, the Minister, in a letter dated 16th April, 1889, wrote Prof. Shaw as follows:—"I hope that I shall never again have occasion to write letters to you similar to this and the one previous. I desire now to say that I cannot understand your objections to frequent, full and frank discussion with the President, in reference to matters appertaining to the general good of the institution. It seems to me strange that you should assume that, although Mr. Mills has held, for fourteen years, the position he now occupies, there is nothing that you might learn from him that would aid you in your work. Surely, during all these years, he must have obtained by experience a fund of practical knowledge that would be of great service to a new professor of Agriculture. I do not mean in reference to the practical work of the farm, but respecting a large number of matters with which you will have to deal from time to time."

His proposition being declined by the Minister, he went to Toronto and interviewed the Minister in reference to the matter on two separate occasions, but Mr. Drury did not agree with his request to modify the by-laws. In his evidence, he says: "Afterwards, I again saw my friends and they interviewed Mr. Drury, and afterwards told me to go back to Guelph and go on with my work, and that in future I would not be interfered with in the sense of doing good work, and I went back. I did not notice very much difference in the attitude of the Minister towards me for sometime, and then there was some movement made by the students of the College in reference to the matter. They requested the Minister in some ways to give larger power to Prof. Robertson and myself. Afterwards, the Minister came to Guelph to have an interview with the students. I happened to be away at the time, and he deferred the interview until the morning. In the morning I went with him about the time fixed with a number

of students, who were represented on the committee, and we had a conversation about the matter. Buchanan was one of the students, McCallum and Rennie other two. The matter was discussed for a couple of hours with the result that the Minister asked if I had received a copy of the revised by-laws, and, not having received one, he said he would see that a copy of the revised by-laws was sent me. He said to the students and to myself that he would see to it in future that I would not be unduly interfered with or hampered in my work. After going to Toronto he wrote a letter bearing on the movement generally."

The following is the letter sent by him on December 13th, 1889:

TORONTO, December 13th, 1889.

DEAR SIR,—Since my visit to Guelph the other day I have carefully thought over all that transpired on Monday evening and the following morning, and have come to the conclusion that the conduct of the students points to a very serious misunderstanding of their true position, both in relation to the officers of the institution and to the Government. I was never more surprised and annoyed than when Mr. Rennie attempted to catechise me in reference to College matters. The whole interview indicated an entire misconception of the position occupied by students, and also appeared to be an indication not only of their willingness to dictate to the President and the Professors but even to the Government itself. Now, I have been asking myself the question: How has this state of things been brought about? That someone is responsible is perfectly clear; and I have little hesitation in saying that the interview of Tuesday morning impressed me with the idea that some measure of the blame rests with yourself. In saying this I do not at all challenge your good faith and honesty in regard to the statements that you have made to me. I must, however, point out that, in the examination that Mr. Rennie called upon you to submit to for the purpose of proving that you were "hampered" in your work at the College, the facts he referred to must have been obtained from you. Take for example the case of the fall wheat. There it appeared to be evident that you had desired to put in a larger quantity than I thought desirable. How did Rennie or any of the other students obtain possession of that fact? I take this instance as an illustration. I can readily believe that you may easily have been led into a false position in this matter. When once it was determined between us that a certain quantity should be sown in fall wheat, that should have been the end of the matter, and no student has the right to put you in the witness box and examine you for the purpose of ascertaining why it was that you changed your mind You are not accountable to them in any sense, and you have no right to permit them to question you as though it was their business and not yours. How can you expect order and discipline to be maintained if this course is pursued. If students come to you any say: Did you not think that so-and-so should be done? and you at once say: Yes, I thought so, but the Minister or the President does not think so,—this course must necessarily lead to demoralization. It is indeed inviting rebellion, and the presumptuous and dictatorial position that the students assumed in my interview with them the other day is the natural outcome. I have no objection to students making requests for changes where their interests are directly affected, but it is an act of impertinence for them to attempt to dictate as to matters of business in connection with the institution.

Then, I would ask you: Who is responsible for the impression that has evidently been made upon the minds of the students that the delay in the purchase of live stock is attributable to myself? So far as that matter is concerned,

the only point of difference that there might be between us is as to whether I should have written you earlier than October 1st instead of waiting for your letter of that date. From my standpoint it was at least as reasonable for me to wait to hear from you as *vice versa* in view of the conversation we previously had in which I expressed the desire that the stock should be placed on the farm as soon after October 1st as possible. But let this pass. The question is: How did the students become so well posted in that matter? If it was through a process of cross-examination by yourself, then I must point out that it was very unwise for you to submit to the examination. Some of the students find fault with some of the stock purchased, which you yourself purchased alone. It must have been known that, so far as the Jerseys and Aryshires were concerned, you had the full responsibility of the purchases, and it occurred to me that the reference made thereto was intended as a reflection upon yourself. I have no doubt that you are desirous of obtaining and retaining the respect and confidence of the students, but, if I interpret that instance correctly, it is questionable whether you are succeeding in doing so. I cannot express to you how much annoyed I was at the position assumed by the students who interviewed me on Tuesday morning; and I am desirous of asking you to sincerely consider to what extent you are responsible for the scene that took place on that occasion.

No matter what the consequences may be, I intend to insist on the maintenance of discipline and proper conduct on the part of the students; and in the event of further trouble it is my purpose to hold an investigation by a commissioner, in order that I may ascertain if possible who among the students is responsible for the stirring up of this trouble, and if it is proved that any among them have wilfully done so, they will no longer be allowed to remain in the institution.

Nothing can be more destructive to the harmonious working of an institution than for any official to fall into the habit of explaining to the students that he desired to pursue a certain course but was prevented from so doing because someone in authority did not concur with his views. Every official must shoulder his own responsibility, and when any course of action is definitely decided upon in a proper manner, the carrying out of the same must be undertaken by the responsible party, who should offer no apologies and make no excuses for what is being done.

I will send you the revised by-laws in the course of a few days.

Yours very truly,

CHARLES DRURY.

Prof. THOS. SHAW,
Agricultural College,
Guelph, Ont.

In reply to which, Prof. Shaw wrote the following letter on December 17th

GUELPH, December 17, 1889.

DEAR SIR,—I am in receipt of your private letter of the 13th inst., and desire to say in reference thereto that I have given it my most careful and respectful consideration.

You will please pardon me for saying that I am a little surprised with the tone of your letter in reference to myself, in view of what transpired between us

in our last interview in Toronto and at the interview in the College, and more especially when you asked me on our parting that I would do my best to restore order and harmony among the students, which I promised you in good faith that I would certainly do.

You say that information used by Mr. Rennie in reference to the questions he asked must have been obtained from me, and cite for illustration the case of the fall wheat. I gave you the only probable explanation I could at the time in reference to this, which you will please remember was to the effect that I might have been incidentally asked by the students as to how many acres we were going to sow, and then again as to why we did not sow this amount. You will remember that I had no distinct recollection in reference to this matter, but gave this as a probable explanation. Of this I feel I am quite safe in saying that Mr. Rennie did not get his information on this point from me. Since the receipt of your letter, without betraying confidence, I have asked Mr. Story if he could tell how the students got this information. He replied that he could, and I requested him to write you accordingly. From this letter you will see that I am entirely innocent in this matter; and it is not improbable that information regarding the other matters referred to in your letter may have been obtained in some way, of which I have not the slightest knowledge. I have told what I knew in reference to those matters, and you accepted the good faith of my statements.

You say there is some doubt in my mind as to whether I am succeeding in "obtaining and retaining the respect and confidence of the students." In reference to this I have only to say that as soon as it is made clear to me that I have forfeited the confidence and respect of any considerable number of the students I will feel it my duty to step down and out of my present position and let some one else try.

I sincerely concur in your desire that the conduct of the students may be in the interests of order and discipline in the future, and I have already said to you that my especial efforts will be put forth in that direction.

Trusting that I have uttered no word of disrepect in reference to yourself, as such was far from my intention, I am,

Your obedient servant,

THOMAS SHAW.

Hon. CHARLES DRURY,
Minister of Agriculture,
Toronto, Ont.

Again, on the 10th February, 1890, the Minister wrote him to do certain work through the President, thus indicating that the revision of the by-laws had not taken place as requested.

After that date no mention appears to have been made by either Prof. Shaw or the Minister in reference to the by-laws. The revision did not take place; and, in May, 1890, Mr. Drury ceased to be Minister of Agriculture.

At the time of Mr. Dryden's appointment, in 1890, the by-laws were in the same condition as when Prof. Shaw was appointed in 1888. Prof. Shaw never mentioned to him that they had been revised by Mr. Drury, and so far as he was aware no revision was ever carried out by the Advisory Board or the Minister.

On December 23, 1890, Hon. Mr. Dryden wrote as follows: "I have been looking over the farm accounts and there are several things cropping up about which I would like some information. I notice that you purchase a good many kinds of fertilizers. Would you kindly state what is the object of this? Is it for the purpose of experimenting with these manures, or have you tested their value and use different kinds for different purposes?

I also notice an account that has been passed for the purchase of wire. I think I spoke about this when I was at the College; but you will see the necessity of refusing to give orders for articles of this sort without consulting with the President, or, if that is not possible, with myself. I suppose this wire would not have been purchased at the present time had you been certain that we were to use the McMullen fence. I shall be glad if all parties will refrain from making purchases without consultation, so that we may know what is being done."

In reply Prof. Shaw, on December 29, wrote as follows: "I notice what you say in reference to the desirability of consultation before giving orders of any great amount for things that may be wanted. I have studiously acted on this principle since my appointment. Since that time I have given no order of any considerable sum without advising with regard to it."

On August 12, 1891, the Minister wrote as follows: "You will further allow me to say that I do not think stock should be disposed of without consultation either with myself or with the President. I am sorry that it does not appear easy for you to consult with the President in matters of this kind, but you will easily understand that if this is not done we shall soon drift into the old position where we had two heads to the institution instead of one. I do not suppose that the President would interfere much with any of the arrangements of your department, but I still think that, as I hold him responsible for all that takes place at the institution, he ought to be in a position to answer any questions I may put to him at any time; and this he cannot do if the professors act independently of him. I hope you will kindly think this over and endeavor to accede to my request so far as possible."

On January 4, 1892, the Minister wrote Prof. Shaw again as follows: . . . . "I want to say frankly to you that I cannot allow matters to continue in the shape they have been in during the past year—I have no sort of check or control. President Mills assumes to check the expenditure in every other department of the institution except your own; but because there has been more or less friction between these two departments he has refused during the past year to keep an oversight of your accounts. This I cannot allow to go on any longer. I must insist on President Mills (who is on the spot and knows what the expenditure is for and is able therefore to unravel any accounts) keeping a supervision over the expenditure of the entire department. If there are any officials about the institution who do not like this arrangement, the sooner they are relieved of their situations the better. It is utterly out of the question for me to keep an oversight of these accounts when I do not know in very many instances what the material is for which the money is paid, nor what necessity there may be for the particular expenditure. Under these circumstances, therefore, I hope you will take no offence when I say that I must insist on the President of the institution keeping a strict oversight of all expenditure in your department as well as in every other."

Again, on March 28, Mr. Dryden wrote to Prof. Shaw as follows: "The farm accounts for the month have just been received. I notice that the President has approved of these accounts, but has added this note—'Approved, James Mills, President; signed without responsibility for farm expenditure.

"I have required the President to have some knowledge of the farm expenditure, the same as in the case of every other department of the institution. He is required to pass the accounts, and I must, therefore, hold him responsible. It appears that so far you have refused to accede to his suggestion as to making proper requisitions. I had hoped to have been able to visit the College ere this, but find that it will be utterly impossible for some time to come. I have, therefore, to request once more that you will comply with the President's suggestion. I see no reason whatever why this should not be done.

I must insist in the future upon having but one head to the institution. I cannot consent to have repeated what occurred last year, and must insist that my former decision be carried out."

On April 2nd, Prof. Shaw wrote the Minister as follows:

GUELPH, 2nd April, 1892.

DEAR SIR,—In reference to your letter of the 28th ult., which bears upon the supervision which President Mills should exercise over the outlay of my department, I beg leave to submit the following reasons as to why, in my opinion, what is required of me would be utterly impracticable and unfair both to me and to the President. Even should you place the responsibility for the success of the operations conducted under my supervision upon the President, the country will not do so, but will hold me, and, I may add, yourself, responsible for the success or failure of the same.

I submit the proposition to you as a business man in this form: Place yourself in the management of your own extensive farm with a man who could at any time veto any expenditure you might desire to make, would it not paralyse your business arrangements? The effect it would have upon you in your private capacity is the same effect that it has upon me in my public sphere.

Let me illustrate: Suppose for the month of April, that in order to be properly prepared for spring operations, I submit estimates of my intended expenditure to the President, which I believe to be the lowest possible amount to ensure success, and that he in his wisdom should see fit to strike out of the requisition 15 per cent., you will at once admit that it would entirely disarrange my plans and make failure a possibility; when, were it otherwise, success might have been achieved. This might occur from month to month, and would be doing a serious injustice both to President Mills and myself. If failure should follow, you and the country as well would hold me responsible for the farm operations, and President Mills would be open to the imputation of deliberately attempting to belittle my efforts when such imputation might be an injustice to him. It might be said that, from a desire to please you on the score of economy, he had imperilled the result of my year's operations. I do not for a moment charge that President Mills would desire to do me that great injury, but it would place in his hands the power of saying that, for the sake of a reduced expenditure in the earlier months of the year, he would run the risk of doing an injury that subsequent efforts on my part could not overcome. Unless President Mills is to have these requisitions placed before him as a mere matter of form it is unfair to place him in that position.

I submit as an alternative proposition the following for your consideration: My estimates having met with your approval, I am prepared to assume the full responsibility of not exceeding these estimates in any single particular without your official sanction. I am further prepared to be judged by the results if I am

left free to direct these expenditures within the limits of the estimates already submitted to you; and if they are exceeded without your consent, to suffer the consequences of the failure of my operations, and to cheerfully place my resignation in your hands at the end of the year.

I have no desire not to work in complete harmony with the President of this institution, neither have I a desire to do anything that will not ensure the work of the farm, and add prestige to you as the head of the Department of Agriculture. I am aware that failure in any particular will detract from your popularity and also the popularity of the Government. Rather than do anything that would imperil the good name of the institution or the success of the policy of your Department, I would submit to great inconvenience of a personal character. My only fear is that the other course would be far more injurious to the success of the institution, and this induces me to put the case so strongly as I have done.

The possibility of having my actions crippled, and my success endangered by interference with my freedom in conducting my own department, urges me to protest against having any other person than yourself empowered to veto any line of action I may deem most beneficial to the institution and to the Government.

I desire further to have it clearly understood that my proposition relates only to my own departments. I have not the slightest desire to interfere in any way with the working of the other departments of the institution.

Yours, etc.,

THOS. SHAW.

To Hon. JOHN DRYDEN,
Minister of Agriculture,
Toronto.

And on April 4th, the Minister wrote as follows:

TORONTO, April 4th, 1892.

DEAR SIR,—I am in receipt of your letter of the 2nd inst. I have given it careful perusal, and I am compelled to say that I do not find in it any reasons against the propositions submitted formerly by me sufficiently strong to cause me to deviate from my decision. In your letter you frankly state that you have no objections to my overlooking your department, to my criticisms, nor to my entire control of yourself and what you do, but you do object to President Mills occupying what you assume to be such a position. You urge that he is likely to cut down your monthly requisitions, and thus cripple your work. Now, should this be the case at any time I should very much like to know of it immediately. I apprehend no difficulty at all in that direction, but through Mr. Mills I would have an opportunity of knowing how the expenditure was going, what was being done, etc. With all due deference to your statements, I desire frankly to state to you that your name is never discussed in Parliament, neither is the name of the President, but the whole attack is made upon *myself and upon the Government.* It would never do for me in my defence to get up and say Prof. Shaw proposed certain things to be done, which were acceded to. These men, I think rightly, take the view that this is a Government institution; it is under the charge and control of the Government, and the Government must be held responsible, not Prof. Shaw, nor President Mills, nor any other professor. Now, whatever your judgment may be, I presume you must agree with me when you come to think the matter out, that the Government must keep control—must know what is being done at the

institution. No other institution under the control of the Government would be run for a single day without this proposition being acceded to.

I desire you further to understand that I have no idea of trying to cripple your work, neither would I allow President Mills to do so. You, however, seem to take this idea for granted that you ought to have entire control of what is done at the farm; that no one ought to be allowed to meddle with you; that you ought to be allowed to work things out to suit your own views, and to make a success or otherwise as may transpire. If you are allowed to take such a course, then any other man who may chance to follow you in your position must be allowed the same privileges. But either yourself or your successor may prove a failure, then, I ask, who is responsible for the failure? You say that you alone are responsible for the failure; and I answer, not so; and the Legislature would answer, not so, in most emphatic terms, and would throw the whole blame upon myself and my colleagues—not upon you.

Under these circumstances, realising as I do the responsibility which rests upon myself as head of this department, I must insist upon keeping some control. The plan which I have adopted may not be the wisest, but it is open to correction if that be the case. I desire, however, to be understood emphatically that I must keep control, and that in order to do so, I must know what is being done as the months and weeks go by. I have thought the matter over, and I cannot for the life of me see any real objections to the proposition to make monthly requisitions as suggested to you by Mr. Mills. You appeal to me as a business man, and I answer you as a business man, and I say to you frankly that I would not allow my man at home to undertake the purchase, and the sale of all sorts of things without my knowledge and consent; and although a general scheme may be agreed upon in the early part of the year, yet I repeatedly and constantly insist upon knowing every detail Now, I ask you, how am I to know the details of the College farm except it be through the President in the way I have suggested. The vast majority of these accounts require no notice at all. Occasionally there might arise something to which my attention would need to be drawn and concerning which a word of warning ought to be given. I hope, therefore, that you will dismiss from your mind the idea that the proposal has been made with the view of curtailing your expenditure in various directions and thus worrying and annoying you in your work. That is not the view, that is not the idea. The idea is perfectly legitimate, plain and clear, and I have again to insist that you comply with the requirements in this direction.

Yours very truly,

JOHN DRYDEN

Prof. THOMAS SHAW,
Agricultural College,
Guelph, Ont.

To the above letter Prof. Shaw replied, on April 9th, as follows:

GUELPH, April 9, 1892.

DEAR SIR,—Unusual pressure of work has prevented me from replying sooner to yours of the 4th inst. In reference thereto I may repeat what I have already stated, that I not only do not object to your supervision over my department, but have pleasure in acknowledging that it is my duty to do everything that I possibly can to protect you from criticism from any quarter whatsoever.

I wish to refer almost immediately to the latter part of your letter, wherein you say that as a business man you would not allow your manager at home to undertake purchases without your consent. Allow me to say that there is no analogy between the two cases. In that instance you are responsible. In this instance you are also responsible, but in my case you wish to place President Mills, who virtually has no responsibility in the matter at all, between yourself and me. You would not attach any blame to President Mills if I failed in my undertakings. The Legislature would not blame President Mills. Yourself, the Legislature and the country would blame me, and I think justly so. You and I would be held responsible in case of failure, and not the head of the institution. Allow me to ask, was President Mills blamed, or was Hon. A. M. Ross censured, when my predecessor failed to give entire satisfaction in his department? I leave it to you to answer the question.

If, as you intimate, President Mills would not be allowed to curtail my expenditures, and that what you propose is only for your information, there could be no serious objection to have President Mills the medium through which you receive that information; and an approximate amount of expenditure could easily be given him. Neither do I consider it too much on your part to ask vouchers to be furnished at the end of the month relating to all expenditures; but to require this daily, as has been intimated to me by the President, would be impracticable. For instance, suppose Mr. Story were to order goods by telephone, which he does more or less every day, I would have to send for him daily to certify to the vouchers. The same would have to be done with the goods delivered to Mr. McIntosh and Mr. Zavitz. Whereas, if the vouchers were kept in my office for one month at a time, they could then be certified to monthly along with the detailed accounts, as is done apparently at the Hamilton Asylum, as you will see by the form I enclose from that institution; and at one time, once a month, they could be handed to the Bursar. In an interview, I could, in a short time, represent the difficulties connected with the plan as intimated to me.

The knowledge of the fact that President Mills will not be held responsible for the success of the farm, but that you will be held responsible by the Legislature and the country, and that I will be held responsible by the country, makes me extremely anxious that the expenditure will be neither lavish nor yet cramped.

Your obedient servant,

THOS. SHAW.

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

And was answered by the Minister on April 11th, as follows:

TORONTO, April 11th, 1892.

DEAR SIR,—I have just this moment received your letter in reply to mine re control of expenditure in your department. Nothing contained therein changes my opinion in the slightest degree. I wish I could make you understand what

I myself feel so strongly, that, in case of success or failure, in all the criticisms in the Legislature, your name would never be thought of, much less mentioned; the attack would be made directly upon myself. So far as the Legislature and the country is concerned, you may decide once for all, that, as head of the Department, I shall be the man who will have to bear the burden of the whole criticism.

You seem to think that President Mills would not receive blame. I presume not—no more than you would; but I should receive the blame in any case. What I wish as between yourself and President Mills is, that he as head of the institution be allowed to occupy that position. If you and your department are not to submit your accounts, neither ought Prof. Dean and his department. Why should not Prof. Dean proceed to undertake any work which might seem good to him, without consulting either President Mills or myself? You can easily see that this would never do. Nobody desires to interfere with the amicable working of your department. So far as I can yet see the request of the President is but reasonable, and I cannot understand why you should so strongly refuse to comply with it. One thing I assure you is certain: I cannot allow these accounts to come to my office at the end of each month for me to overlook, as that is an absolute impossibility; they must be overlooked by the head of the institution on the spot.

Yours very truly,

JOHN DRYDEN.

Professor SHAW,
Agricultural College,
Guelph, Ont.

On April 25th Prof. Shaw again wrote as follows:

GUELPH, April 25, 1892.

DEAR SIR,—Please excuse the delay in answering your letter of the 11th inst., which has been occasioned by an excess of work, caused in part by the Easter examinations.

After what you have said in reference to the subject of our recent correspondence relating to the necessity of submitting requisitions to the President at the middle of the month for all purchases required for the following month in the respective departments under my charge, any further reasoning or explanation on my part would seem to be of no avail.

I have, therefore, decided to give a fair trial to your proposal to have such requisition made out at the times stated, commencing with May 15th following. I do so not because I believe the scheme will work well (on this point my mind is unchanged), but because you insist upon having it done, and I desire to meet your views as far as I can. But I do so with the distinct understanding that the President will not be allowed by you to interfere with my proposed purchases. I understand you to intimate as much in your letter of the 4th inst., and I shall expect such protection at your hands.

You will also pardon me for again reminding you that it is my determination, as previously expressed to you in my letter of the 2nd inst., not to overstep the estimates of my departments in a single instance without your official sanc-

tion. In this, therefore, you have a guarantee that the mistake of last year in overdrawing the estimates for that year will not be repeated—a mistake which, as I have once and again stated, I was even less responsible for than others over whom I have no control. Trusting that what I have said in this letter may meet with your approval and so end the difficulty.

I am,

Your obedient servant,

THOMAS SHAW.

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

On June 8th the Minister replied as follows:

TORONTO, June 8, 1892.

DEAR SIR,—I observe a clause in one of your former letters to which I omitted to reply. In your letter of the 25th of April you stated that you proposed to submit requisitions as required, on the understanding that you are not to be interfered with in your proposed purchases. I shall not say that there will of necessity be any interference, but I have charged the President of the institution with the oversight of the expenditure of the different departments, and I shall hold him responsible therefor. I presume that he will have something to say, if any wrong expenditure is sought to be incurred.

Yours very truly,

JOHN DRYDEN,
Minister of Agriculture.

Prof. SHAW,
Agricultural College,
Guelph, Ont.

In his evidence, Prof. Shaw stated as follows:

Q. Notwithstanding the repeated letters from the Minister directing you to recognize these by-laws, so far as December, 1890, you did not recognize them till October, 1892, in their entirety?

A. Yes, in their entirety.

Q. You refused to recognize them, or to carry out the requests contained in these letters?

A. I did not refuse, but I resisted, by continuing to communicate with the Minister. I did not refuse to carry out the requests, but conducted correspondence in regard to them I did refuse for a time.

Q. Up to March, 1892, all the letters I have read requested you to carry out the by-laws, and you refused.

A. In some particulars, regarding consultation with the President, I did not because I had been promised a revision of the by-laws.

Q. Did you ever speak to Mr. Dryden about that fact—that he should modify them, or that Mr. Drury had modified them ?

A. No, I do not think so.

Q. At any rate, he never agreed to modify them for you.

A. Not since he was Minister.

Q. On April 25, you replied to the Minister, and the Minister wrote you on June 9th. How did things go on after that ?

A. I put in an estimate, and there was a racket kicked up right straight. The President struck out the item for a camera, then the correspondence followed between myself and the President that was read last night.

ADVISORY BOARD RECOMMENDATIONS.

The Advisory Board made recommendations from time to time that were communicated to you. On October 30th, 1890, a letter was written by the Chairman to the Minister, and a copy was sent to you immediately ? A. I think it was.

The following requests were made in the letter, namely : "We think there are a few things which have been rather long neglected, and others which have been overlooked, which at all times should receive prompt attention. Among the former we would mention the private roads running from the Brock road to the north-east side of the farm. This we would strongly urge be put in first-class shape as soon as possible. Further, we think it to be somewhat of a mistake to take in hand any extensive improvements of the public roads so long as there is much requiring attention on the farm.

Another matter which we think should not be delayed a day longer than can be helped is the levelling, removing rubbish and in other ways making neat and trim the surroundings of the piggery, or anywhere else around the buildings or yards where work may be required to put the establishment in the shape it is desirable it should be as a model for the students, who are having their tastes moulded by what they see around them. Going more into detail, we would recommend that the yards attached to the piggery be made so as to be more in keeping with the building. That more attention be paid to keeping cattle and sheep yards in better shape. It is to be borne in mind in this connection that the farmers of the country as well as the students go there to learn and carry home with them what may be useful knowledge in carrying out the operations on their own farm.

In regard to matters overlooked, we refer particularly to broken door fastenings and doors hanging on broken hinges, these should not be allowed to go unrepaired for a single day. We would further add that if there is any doubt as to what department the attending of the above matters belong to, we would advise that it at once be settled as to whether it is the duty of the President or the Farm Superintendent to see to the carrying out of the above mentioned work.

Referring again to the private roads on the east side of the farm, we think it would be well to remove the stone dyke and the old fences, and build one on either side of the road in uniform style ; also to continue the fence straight where the jog now is, near the rear of the farm, and make it at the point where it joins the land owned by Mr. Stone ; also a gateway on the south-east side of the road between the experimental barn and the weigh scales would make it more convenient when weighing had to be done.

There is now a considerable piece of land unused between the paddocks and the roadway leading to the field in which is the vinery. This could be used to good advantage by making it into two large paddocks with strong fences like those built around the ones in present use.

Our opinion having been asked as to whether we consider it advisable to add to the acreage of the present farm by renting an additional 100 acres, in reply we would say that our unanimous opinion is that the farm is already quite large enough, in fact we are rather inclined to advise the Government to take into consideration the question as to whether it might not be in the interests of the institution to sell the outlying portion comprising some 50 acres, which is so situated as to be inconvenient to work with the main part of the farm.

All of which is respectfully submitted,

JOHN I. HOBSON,
Chairman.

Q. Did you attend immediately to the matters referred to therein?

A. As soon as I could. Attention was given right away to the doors, etc. I instructed the carpenter to see that these things were fixed all the time. I attended to the roadway as soon as I could without getting a special grant. About the removal of the rubbish, I did that only in part as winter was closing in.

Q. Were the yards kept in order?

A. After they were fitted up.

Q. And the cattle and sheep yards?

A. I think fairly so.

Q. And the private road?

A. So far as we could do it, it was attended to the following year. It wanted some gravel yet. We have been at it four years.

Q. You completed the public highway first?

A. I thought it would have the most marked effect upon the public. I have gone on that principle in carrying on all the farm improvements, especially those relating to roads. We are doing them without a special grant—putting in the odd time of men and teams—and in that way they are of no special cost.

Q. The Minister wrote you the following on May 30th, 1891:

DEAR SIR,—I believe you are to have an excursion party at the farm, about June 10th, from the County of Kent. I am very anxious that the barns and yards should be in as neat and tidy a state as possible at that time. I am aware that at present you are trying to grade the roadside. This is not an unimportant matter, but to my mind (and my opinion is endorsed by every member of the Advisory Board) it is secondary to the neat appearance of the buildings and their immediate vicinity. One hundred people will notice everything about your buildings to one who will go out on the road and make the slightest remark about its condition.

I heard from Mr. Donaldson, who visited the farm a few days since, and he

complained that the *debris* at the south side of the barn was still there. I have assured the members of the Advisory Board on several occasions that all this would be removed and put in proper shape if they would give us a little time. Now, my reputation is at stake as well as your own, and I therefore have to insist that you will *find time somehow* to put this matter in shape *at once*, and if there are any other matters about the buildings that should be put in order, kindly have them attended to so that when the excursionists appear on the scene there will be nothing unsightly for them to observe. They are very sharp in detecting these little things, and will never see some of the greater ones, which you and I would perhaps value more than they.

Yours very truly,

JOHN DRYDEN,
Minister of Agriculture.

Q. What roadside does he refer to?

A. That is the year we graded the road outside the College.

Q. What did you do after that letter?

A. I had intended to go on at it right away—but you will notice the date of the letter—there were a thousand things that required attention.

Q. You were told to do it at once, but it was not in your mind to do it then?

A. I had honestly purposed to do it as soon as it could be done without neglecting putting in the crop.

On December 3rd, 1891, the Minister wrote you again as follows:

The second point is in reference to the barn-yard and the management of manure.

The report on this point reads as follows:

"We would recommend that the paving along the front of the barn, horse stable and bull shed be extended out for 12 feet, and that along the side of the sheep yard it extend from the wall of the yard to the end of the bull stable, or about 16 feet wide, and at the corner of the yard the paving be so rounded as to allow ample room for turning wagons—the idea being to have a full width wagon drive all around the yard as well as having a wide and clean causeway for moving cattle from place to place. We would further advise that strict attention be paid to keeping such roadway perfectly clean all the time."

"Regarding the management of the manure in the yard we consider no management to be right where the manure from the different classes of stock is not mixed together as it is made; and further, as far as possible, it should be kept nicely piled up. We would emphasize what we have said on the management of the manure, not only on account of the importance of the matter itself and as an education to the students, but further, that it must seem strange to farmers attending institute meetings to hear learned talks on manure management after seeing the farm-yard of the College farm."

I quite agree with the above suggestions. The opinion of this Board of of practical men ought to have weight in connection with a matter such as this, and I trust, therefore, that, so far as the management of the manure is concerned, you will give special instructions to have the suggestions carried out.

As to the extended paving around the outside of the yard that, of course, cannot be done in the meantime, but I think it is a good suggestion, and if carried

out would form an ample roadway for the animals when taken out to the field or for exercise, and would tend to keep their feet in better condition than when they are obliged to wade through mud and mire as has been the case in the past. This extended paving can be attended to during next season.

I hope that you have by this time given attention to the culling of the pigs, as suggested in our conversation.

Yours very truly,

JOHN DRYDEN,
Minister of Agriculture.

Professor THOMAS SHAW,
Agricultural College,
Guelph, Ont.

Q. Was that attended to ?
A. Yes, it was done next year.

Q. On the 14th April, 1893, the Minister wrote to the President as follows :

TORONTO, April 14th, 1893.

DEAR SIR,—I desire that you should call the attention of the Farm Superintendent to some necessary improvements which should be gone on with during this season if possible.

First: I would mention the necessity of completing the grading, gravelling and fencing of the lane. This work has been under way for a very long time, and ought to be brought on to completion as speedily as possible.

The second thing is the roadway crossing from the College grounds to the experimental plots. There does not appear to have been any expense upon this roadway, and yet perhaps in summer time it is used more than any other roadway about the institution. I think some effort should be made to put it in a proper state of repair at once.

Third : The plot of ground known as the wood-lot to the east of the buildings should be cleared up and levelled and so made to present a proper appearance. Some time ago I received a communication from the gardener stating that he had some pine trees in some nursery which must necessarily be moved within a short time or they would be spoiled. It has occurred to me that it would be desirable to plant a few of them on this wood lot, but this cannot be done while it is in its present shape. I have observed that there are various piles of stones and stumps which must be cleared away before the levelling process is commenced.

There are also some minor improvements which ought to demand the attention of the farm superintendent. The more prominent one is the fence opposite the College and across the highway to the west. I have observed for the past two years that this fence has been in a somewhat dilapidated condition, and as it occupies a prominent position it should be at once attended to. The expense in this regard would be very limited indeed.

It appears to me it would be a desirable thing if the plot of ground to the north of the farm buildings is to be made, as has been the case in the past, a general receptacle for piles of posts, lumber, pits of roots, etc., that it should be fenced with a high board fence, so that it would not be such an eyesore to those visiting the institution as it is at present. This is not so pressing a matter, however, as some of the others I have suggested.

I desire to draw your attention also to the absolute necessity of providing a suitable building, which need not be very large, for lanterns, oils, etc. I observed

when at the institution that the lanterns used about the buildings were kept in a room in the barn, and that the floor and shelving of this room was more or less saturated with coal oil, and from the presence of burnt matches about the places, I do not doubt that the farm servants light the lanterns there. It appears to me to be a dangerous operation, and that there is a danger of fire taking place from its existence there. Instructions should at once be given to the carpenter to proceed with the erection of a suitable building. This should be attended to without delay. I did not allow anything in the estimates for this building, because I think that if we are to have a carpenter about the institution such work as this can very properly be undertaken by him. . .

Yours very truly,

JOHN DRYDEN.

President MILLS,
Agricultural College,
Guelph, Ont.

Q. I understand that regarding the permanent improvements you complained to the students and others that you did not get enough money?

A. I did not complain of that. When I was asked why certain improvements were not made I simply said I had no permission or authority to make them.

Q. You have expended $6,200 on this work during the last four years without counting student labor?

A. I think some items are added which I did not directly incur, for instance, gravelling around the barns.

Q. You have said you did not think there should be any Advisory Board over you?

A. I do not remember, I will not swear I did not.

Mr. John I. HOBSON, Chairman of Advisory Board: "The duties of the Board are to go over the farm carefully, study out the stock management, the system of farming and any other thing which we consider properly comes under our duties. After discussing such matters, the report is drawn up in the shape of recommendations and handed to the Minister. These recommendations have not been carried out by a long way. We considered there was too much confusion around the buildings, especially the piggery. It was left in a very confused state for a long time, I think between two annual meetings. It was a comparatively small matter, but was very objectionable and very undesirable. It was not attended to till a a good long while after our recommendation.

Q. Were the recommendations of the Board carried out by Professor Shaw immediately?

A. No. I think I mentioned some instance before. I heard the evidence this afternoon and I agree with all that was said in this regard, that the work was done only at long intervals afterwards. I remember with regard to the condition of the fence around the building. We objected to these broken hinges and windows. Also, I think, we recommended the paving of the yard before it was done

Q. Professor Shaw swore that you never told him to do anything; and that he did it at the time he was told.

A. Everything we suggested went in a report direct to the Minister.

WANT OF HARMONY WITH THE MINISTER.

The following are the instances given by Prof. Shaw of want of harmony with the Minister, in which he considered he was not fairly treated:

(1) In keeping Barnett, the cattleman, as herdsman.
(2) In cutting down the estimates for 1893.
(3) Purchasing stock in the Old Country.
(4) In reference to the cutting out of bulletins.
(5) The small number of bulletins given him.
(6) Not getting help in his office.
(7) In reference to the keeping of pedigrees of stock.
(8) In reference to taking the Experimental Department from his control.
(9) In not getting an opportunity to purchase stock in time for experimental work in one instance.
(10) In charging him for being responsible for the large expenditure when he considered he was not responsible for a large part of it.

As to the Cattleman.

Prof. Shaw's grievance was that the Minister kept him here contrary to his wishes. He was brought here by the Minister with Prof. Shaw's consent. He came in April, 1891. In his evidence he stated:

"I had known Barnett before this, having met him frequently at shows, and knew him to be a good feeder. After his appointment things went on fairly when I thought he was inclined to feed too high. I did not tell him so at first but did some time after. I took it for granted that the man the Minister would recommend would probably be the right man, and that if I interfered seriously and the stock got on badly, the Minister would look on me as having been the cause of it instead of Barnett, and I thought it well for me—to use a common phrase—to use 'a common rut for a good wheel.' I spoke to Barnett about overfeeding, but I do not know the time. At first I spoke to him through Story, that the amount of feed was too large and ought to be reduced. I did not tell him to what extent to reduce it. I told him that some of the bulls were in too high flesh—the Jersey was one; also the Shorthorn, and some others that I do not remember now. This was, I think, in August, 1891. The feed, I think, would have shown as much on the cattle as stated in two or three months. I asked him what he was feeding certain animals, and he told me about certain amounts, and I told him I thought it should be reduced. I cannot remember the exact words. I think I told him to what extent; but it is a difficult thing to say how much shall be given to each animal; it cannot be done. I do not know how often Story spoke to him, or whether he regarded what I wanted him to do. I cannot say when I spoke to him the next time, or how many times I spoke to him, but I talked to him more than once. He stated that he was not overfeeding these particular animals. It would be hard to say how much he overfed."

"Shortly afterwards a serious difficulty arose in reference to orders. I wished a pen for carrying on an experiment. The cattleman wished that pen for a lot of sheep that were, as he said, expected to breed a short time after, although as it turned out they did not breed. I told him I would like that pen for my experimenting. A few sentences passed between us, and finally I gave him to understand I would have it. He resigned. I promised to give him a pen in time. I did not give it to him at the time promised. I got the pen. This was the latter part of November. I accepted his resignation and wrote to the Minister on November 28th, as follows:

GUELPH, Nov. 28th, 1891.

DEAR SIR,— I regret to have to say to you that I have received this morning the resignation of Mr. Barnett as feeder. He intimated that his resignation will take effect at the end of the year. He also stated to me that he had written to you similarly, and I suppose he mentioned the reasons. However, I think it proper that I should give you a candid statements of the facts.

Yesterday morning, I went into the sheep pen with Mr. Zavitz to ascertain where exactly would be the best place to repeat our experiment with the ten shorn and unshorn lambs. I had previously enquired of Mr. Barnett as to whether there would be two vacant pens. He said there would be, but intimated his desire to retain certain of them. I think I am right in saying this. I then told him that we would like to have the large pen, in which the young lambs are kept for the purposes of the experiment, as no other pen would be warm enough in which to keep the newly-shorn lambs for a month or two. I mentioned that I hoped he would cordially fall in with the proposal, although it might not be quite in accord with his previous desires. He at once strongly objected, stating that if the pen were so used it would be because I had the power to arrange otherwise. I asked the reasons. The only objections that he made were that the pen would require to be rewashed before putting the imported sheep back into it. I said I would see that that was carefully done, and in time to answer his purpose; but he apparently had his mind made up, and intimated that it was to be a choice between him and the pen. I reasoned calmly in reference to it, as Mr. Zavitz can testify, but it was no use. In about ten minutes after he asked me would I accept his resignation. I said not to-day, and that I thought he should not tender it, that he had better wait and think coolly over the matter. When I met him this morning he told me he had tendered his resignation to you and to me. I said to him that so far as I was concerned I would accept it, as unless my reasonable wishes were carried out we could not make our work succeed. May I ask you to kindly let me know how far you think the man in charge of the cattle in quarantine would be able to fill Mr. Barnett's place ?

Your obedient servant,

THOS. SHAW.

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

And received a reply dated November 30th, as follows:

TORONTO, Nov. 30th, 1892.

DEAR SIR,—I am in receipt of your letter in reference to the resignation of Barnett. I am extremely sorry that matters cannot be arranged at the College so that there might be less friction between the herdsman and those in charge. I presume that the incident that you mention would not in itself have been sufficient to cause his resignation, but that is simply the last straw on the camel's back. Barnett is altogether too anxious to make his part of the work a success, and in doing so is liable to run foul of others who are not so particular whether it succeeds or not. It is quite clear to my mind that there are certain persons in connection with our institution who take no interest in this department, and do not seem to care whether it is properly carried on or not. But I may tell you

decidedly that I do take an interest in it, and think that I am right in reference to it, and that it should be carried on so that these animals may be kept in proper shape both for the instruction of the students and for inspection by the general public. It cannot be said that this has been done in the past. I believe Barnett quite capable of managing his part of the work if matters were made as comfortable for him as they should be. This you will know has not been the case up till the present, and I presume that on this account he desires his release. He seems to have made up his mind that if Mr. Story is allowed to dictate, etc., he cannot make the work the success that he knows I desire it should be made.

I think you will find his place not easy to fill; you may get one to feed cattle, but one who understands the management of both sheep and cattle is not easily found. I am extremely sorry, because I was anxious to see what could be done in the way of making the sheep more successful than they have been in the past; and I think that would be worth more to us than any experiments you may make in reference to shorn and unshorn lambs. However, it may be that you are right in reference to the matter and that Barnett is wrong; I am not saying that this is not so, but I am very sorry that matters have come to such a crisis that we will probably have to release him from his duties.

As to the man in charge at Quebec, I have no hope that he will be able to fill the place now occupied by Barnett. He may do as well as your man did last year, and will serve as a makeshift. He may be better than I expect, but I do not think it likely that he has had any experience among sheep. I shall probably receive a letter from him in a very short time and will see what he says; but in any case I hope that Barnett will not be permitted to leave until we have our new stock fairly in position. I have written to him to this effect.

Yours very truly,

JOHN DRYDEN

PROFESSOR SHAW,
Agricultural College,
Guelph, Ont.

I had some conversation with the Minister in Toronto about it. On Dec. 3rd I wrote in reply stating: "I received your letter of 30th ult. I notice what you say therein."

On December 14, I again wrote to the Minister as follows: "In reference to the feeder Barnett, while I would like to fall in with your proposition that he remain with us till spring, and because you desire it, I am at the same time convinced that it would not be in the best interests of the institution, all things considered. I have, therefore, concluded to ask you to have another feeder take his place at the end of this month; and desire to assure you at the same time that I have not reached this decision without having given the whole subject careful and mature thought."

On December 16th, the Minister replied as follows: "In reference to retaining Barnett as herdsman, I have to say that I must insist on his remaining till at least March 1st, unless it can be shown that we have some one equally competent to take his place. You do not say you have any other person on hand. You will be away from the College during the month of January, and I therefore think it very desirable that the cattle and sheep he has now in charge,

which will be supplemented by those in Quebec in a few weeks, should be in proper shape before he leaves. It may be that the herdsman in Quebec will prove to be exactly the man that is wanted, but as I do not feel at all confident as to this, I have to insist that Barnett be retained until the time I have suggested. After that he will leave, as I can see no object in seeking to retain his services where it seems impossible to reconcile the different parties interested. I have never given instructions to the herdsman, only I presume he knows my wishes as to keeping the animals in presentable shape, and I believe that is essential and very important."

On 24th December Prof. Shaw wrote as follows:

GUELPH, Dec. 24th, 1891.

DEAR SIR,—Your letter of the 18th inst. received. I have delayed the reply purposely, that I might give sufficient consideration to the matter relating to the continuance of the services of Mr. Barnett, the herdsman.

I have tried to look at the matter in all its bearings: and while I am desirous of meeting all your views, I cannot conclude that it will be to the interests of this institution to have Mr. Barnett remain any longer than the time mentioned in my letter of the 14th inst., that is to say, the end of the year. I do not see wherein the difficulty would arise from retaining the services of Mr. Barnett until March 1st, the date mentioned in your letter. It seems to me that if his services are essential up to that period they will be more essential afterwards, when the young stock begin to come to hand numerously. The arrival of the cattle from quarantine should not, in my opinion, prove a sufficient reason, as the feeder who successfully cared for them in quarantine should be able to care for them with at least equal success in our stables. I have, therefore, to recommend that the person referred to be put in charge of the stock at the end of the year. If he prove incompetent, we can then endeavor to get another.

We managed the live stock for four months last winter with, it seems to me, a fair measure of success in the absence of a regular feeder. We also managed them during the year in which Mr. John Harvey remained with us with less of loss than ever occurred during any previous year in the history of the farm, and less of loss perhaps than will take place during any succeeding year. It seems to me this should be some guarantee that we are capable of managing this work with a fair measure of success when allowed to do so. I hope, therefore, that you will give the recommendation of this letter and the opinions expressed therein your favorable consideration, and will take it as a favor to get a reply before the end of the year

Your obedient servant,

THOS. SHAW.

Hon. JOHN DRYDEN,
Minister of Agriculture,
Toronto, Ontario.

On 28th December, the Minister wrote in reply :

TORONTO, December 28th, 1891.

DEAR SIR,—I have your letter of the 24th inst., referring to the dismissal of Barnett. I presume that, had I not interfered, Barnett would have been pleased to have left the institution at the time suggested, but I felt that it was not a wise thing to leave the valuable animals which are now being collected at the farm in the hands of inexperienced persons. I therefore requested Barnett, if for no other reason, as a personal favor to myself to remain until the time indicated in my letter. He consented to do so. Now, if this arrangement be set aside, you will see the awkward position in which I shall be placed. Barnett, I know, has now no idea of leaving until the date you mention, and I do not see that it would put me in a proper position at all to ask that any other arrangement be carried out than the one I deliberately entered into. You say that the interests of the institution will be jeopardized by his remaining longer. You give no reasons for such a statement, and therefore I have no reason for knowing why this should be the case. I can see plenty of reasons why the interests of the institution might be jeopardized if he leaves, but none if he remains. I quite agree that his services may be needed, and even more essential, after the first of March next than previous to that date ; but this does not alter the fact that his services are needed at the present time. You suggest that the feeder who is now caring for the cattle in quarantine should be retained and his services employed when the cattle arrive, and you argue that he who successfully cares for them in quarantine should be able to care for them in our stables. The difficulty about this is that no one knows as yet that he is successfully caring for them ; in fact the poor man himself is in desperate trouble because things are not going as he would like in quarantine. The Shorthorn bull has been sick for some time, although he is now reported to be somewhat better ; one of the cows has slipped a calf and it is dead. I do not mention these things desiring to find fault with the young man, because I believe he is doing his best, and he may be after all just the man we need at the farm, but I mention them to show you that no one knows that he is a successful herdsman, such as we ought to have at the farm.

You mention, too, that you have successfully managed without a herdsman at all before now. That argument would carry you too far, and would simply mean that we need not have a herdsman. For my own part, I do not consider that the man Harvey, whatever excellent qualities he may have, is a good feeder. Personally I would have decided objections to anyone who fed on the principles he employed while at the College, and I apprehend that there was more feed wasted during his stay than has been the case since.

On the whole, I see no good reason for dismissing Barnett at the end of the year except your own strong wish to have it done, and I think that under the circumstances you should not press it. You will remember that you were greatly delighted when I interfered and used my best endeavors to get Barnett to come. No one, I think, about the institution can say that he has not given satisfaction as a feeder and caretaker of stock. He may have fed the stock in a more expensive way than you have been accustomed to in the past, but I do not see as I look at them that they are in any better condition than they should be at an institution of this kind, unless we want to get ourselves into disgrace so far as the cattle are concerned. The stock are in no better condition than are the best herds all over the country.

Yours very truly,

JOHN DRYDEN,
Minister of Agriculture.

Prof. SHAW,
Agricultural College, Guelph.

On January 14th Prof. Shaw wrote the following letter to Mr. Dryden :

MARSHVILLE, 14th January, 1892.

Hon. JOHN DRYDEN,
Minister of Agriculture,
Toronto.

DEAR SIR,—The holiday season is now passed by a fortnight, and it seems it is still your determination to have Mr. Barnett, the herdsman, remain with us, notwithstanding that he tendered to me his resignation, which I accepted, and according to which he should have left us at the end of the past year. When I received your last letter bearing upon this subject, I could scarcely think it possible that you would insist on having Mr. Barnett remain longer than the end of the year in the face of my expressed wish to the contrary, but it seems that in this view I was mistaken.

While I suppose I can only submit to your decision in this matter, you will please allow me to call your attention to the fact that by the course you have pursued in this matter you have taken a step which must prove destructive to a greater or less extent to the discipline of this institution.

By the action you have taken you have put Mr. Barnett in a position to refuse to take orders from me or from Mr. Story, the farm foreman, and to disobey these orders when given. Following the example you have thus set to its legitimate conclusions, it would justify not only Mr. Barnett in disobeying Mr. Story, and Mr. Story in disobeying me, but it would justify me in disobeying you, which would mean that such a thing as discipline did not any more exist in the institution. I may also mention that, before you interfered in the matter of Mr. Barnett, the utmost harmony existed, so far as I know, between all the different subordinates in my departments, but it is not so now.

I was not surprised then to learn from Mr. Story a day or two since that Mr. Barnett had set his orders at defiance in reference to a request that I consider both reasonable and legitimate, and I now desire to say that I decline being held responsible for these acts of disobedience on the part of Mr. Barnett and the consequences which may grow out of them.

Your obedient servant,

THOS. SHAW.

On February 18th the Minister wrote as follows :

TORONTO, February 18th, 1892.

DEAR SIR,—I have had Barnett to Toronto as requested, and find that no difficulty need be entertained as to the future relationship between Barnett and yourself, provided the effort be made on both sides to work harmoniously together.

I questioned Barnett closely as to any conversation that he might have had with others about the institution which might tend to breed discontent, and I am certain that there is nothing in the idea that he has done anything whatever to create a disturbance.

From a close examination of the bills in quarantine, I am certain that the young man who had the charge of the cattle there would not prove a very economical feeder. I believe from further inquiries I have made that he has

spent most of his time among horses, and that he knows comparatively little about the management of cattle and nothing whatever about sheep. Under these circumstances, I do not think it advisable to try to engage his services even as an assistant feeder. I understand from Barnett that the young man states that it is his intention to return to the Old Country. I do not think, therefore, that it would be wise, unless you have urgent need for them, to continue his services about the institution.

I shall have some further conversation with you in reference to the matter, but I hope that a strong effort will be made on all sides to endeavor to work in harmony, and to put the stock department of the institution in as strong a shape as possible. But we can never do this if one part of the institution is pulling against the other. You will always find me doing what I can to give strength to all of you in your different departments. What I plead for now is harmony. Let that prevail and we shall have no difficulty.

Yours very truly,

JOHN DRYDEN,
Minister of Agriculture.

Prof. SHAW,
Agricultural College,
Guelph, Ont.

On May 11th, 1892, Prof. Shaw again wrote to the Minister as follows:

GUELPH, May 11th, 1892.

DEAR SIR,—In justice to me, and I may add to you also, I feel it my duty to again call your attention to the relations between Mr. Barnett, the herdsman, and myself. I was incidentally informed a day or two ago by one of the second year students that Mr. Barnett said to him not long since that he (Mr. Barnett) "didn't take his orders from me any more, that he got them from the Minister in Toronto," meaning, of course, yourself. The same student further said to me that it was common belief with many of the students that such was the state of affairs. I am astonished at such a statement after what you said to me as to non-interference with Mr Barnett's work. If it is true, you are doing me a great wrong. If it is not true, then the herdsman has done both you and me a great wrong. He has wronged you in misrepresenting you and in having said what might in the future bring you into serious trouble, for where such knowledge exists among a number of students of both sides of politics, how is it possible to keep such matters from the general public and from your own constituency, which sends several students at the present time, and in which the circulation of such statements could not fail to give you a great deal of trouble. He has also done me wrong in the disrespect which such a position as he has represented I hold must bring along with it to the mind of the student.

You will also please allow me further to call your attention to the condition of the stock at the present time, as you have not been able to inspect it personally since the beginning of the year, and also to what has happened in that line since Mr. Barnett came here a little more than a year ago. I pass by the losses among the sheep last summer from tape-worm, for which he is not responsible, but I may add in passing that there was much mortality among those sheep which did not arise from tape-worm. I say nothing about the two Guernseys which were lost at

sea, and the Ayrshire, of the new importation, nor of the death of the imported Leicester ram lamb and the imported Sussex bull, after reaching the farm I speak of other losses and conditions, for nearly all of which Mr. Barnett is, in my judgment, directly responsible. One of the four Leicester ewes imported has died. The remaining three have three lambs alive and two dead. The five Oxford Downs imported, as I said to you before, will not register. One of the ewes produced a grade lamb early; the other three have one living lamb and two dead. The ten Shropshire ewes have eight living lambs and eight dead, and the ram is practically useless. The four Hampshire Down ewes have four lambs alive and three dead. The four imported Southdown ewes have produced six lambs, all of which are dead. The four Suffolk ewes imported have no lambs, as the ram is apparently useless as a getter. The eight imported Dorset ewes produced two grade lambs and three pure. Four of the ewes are without lambs, as the ram is supposed to be useless. From the whole importation of 37 ewes now alive, there are 19 pure lambs living and 21 dead, and of the 19 living nearly one-half of them will not prove saleable. I believe Mr. Barnett is responsible for this condition of affairs with the sheep, as in my judgment they have been overfed with grain. Since I came to this place we never had such a showing among sheep at this season, or anything that would compare with it.

The state of matters with the pigs under Mr. Barnett's charge is no better During the winter one of the best imported Yorkshire breeding sows died, also one of the best Berkshires. Two imported Tamworth sows produced 22 pigs, of which 18 are dead. A Yorkshire sow carrying pigs was allowed to be served with the Tamworth boar. A young Yorkshire sow died and was dissected by Mr. Barnett, without ever reporting her death. The Tamworth boar is in a condition unfit to be seen by the general public at an institution such as this. I look upon Mr. Barnett as directly responsible for much of this loss. He is inclined to blame the cold floors, but I ask you to remember, please, that these are the same floors in which we bred pigs during the two years previous to his coming with marked success.

The state of matters with the cattle is not so bad, but it is bad enough. When Mr. Barnett came here there was not an animal about the place, either male or female, that would not breed. Now the Shorthorn bull is not getting calves, and from the six Shorthorn cows we will have only two calves for the sale this fall. Mr. Barnett, in my judgment, has overfed these cattle and the stock generally. I did not interfere with his feeding as it was your proposal to bring him here, and as he was an old feeder of your own in whom, as I gleaned from your conversation and your letters, you had every confidence. I have furnished him with such supplies as he asked for when the same was in my power. I have already called your attention to the fact that it was owing to what I considered extravagant feeding on his part that the estimates were so overdrawn in that department last year. I felt that if I restrained him in feeding after what you said to me, and then failure were to follow, I would be charged with the same.

These results contrast strongly with our success during the year when I managed the stock according to the dictates of my own judgment. I refer to the year 1890, when from cattle and horses valued at $9,015.97 the total loss was but $50. It is true that same year we had considerable losses from tape-worm, but they were far less than under Mr. Barnett's management last year; and in this connection I would again remind you of my previous recommendation not to keep sheep on this farm in the summer for a number of years till we can get rid of the tape-worm.

I desire to say further that I have in my possession a letter from Mr. Story, the farm foreman, bearing date of November 6, 1891, declining to be held

responsible for Mr. Barnett's work and complaining that Mr. Barnett was untidy in his work, notwithstanding that he had been given more help than any of his predecessors, and that he had been inattentive to orders given. I ask you, how am I to manage this department under such conditions, or how is it possible for me to make it a success?

You spoke in the autumn of bringing the Legislature up to visit us some time in the winter. I must say I was glad the members did not make that visit. I am ashamed to go through the stables now with any farmer who visits us and to have to answer his questions regarding the breeding results from the live stock; and I feel it my duty in justice to myself to again remind you that I decline to be held responsible for the acts of Mr. Barnett or for the success of his department from the day that I requested his removal.

Your obedient servant,
THOS. SHAW,
Professor of Agriculture.

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

And on May 27 the Minister replied as follows:

TORONTO, May 27, 1892.

DEAR SIR,—I duly received your letter in reference to the relationship between Barnett, the herdsman, and yourself. Some matters mentioned therein require further investigation on my part and shall receive attention later on. I desire, however, at once to correct the statement you make as to Barnett's receiving his orders from me. Until I visited the College a few weeks ago I had not seen Barnett nor had any communication with him, direct or indirect, since about Christmas. It is therefore impossible that I should give him orders, and I desire you distinctly to understand that nothing of this kind has ever been done. I am aware that yourself and some others about the institution seem to have the impression that Barnett is there under my instructions as a sort of spy to give me information which I ought not to receive. This has been known to me for some time. I told you, I believe, in a former conversation that this was an incorrect supposition. Barnett himself will not say that I have ever given him any orders, but will say exactly the contrary. Whatever some student may have told you evidently passed through two or three parties and when delivered to you, was probably either a misstatement or a misunderstanding. I intend to ascertain, however, whether such a statement was made by Barnett or not, because if he made it he did so without any ground for so doing.

I might also state that I think you do yourself a great injustice and the institution a great harm in conversing with students about matters of this kind. I stated this to you on a former occasion and my opinion has not been changed. There is always about an institution of this kind more or less inclination to gossip, and when a matter such as this happens to be talked of between yourself and any of the students it is simply advertised throughout the whole institution.

I think I quite understand the motive which prompts your letter. I think I fully understand also that you have not changed your mind and that you desire

to be rid of Barnett. I further understand your intention to make me personally responsible for anything which may happen of the nature suggested in your letter in connection with Barnett's department. I desire it to be distinctly understood, however, that I shall accept no such responsibility.

It is quite easy for matters to be so arranged that neither Barnett nor any other herdsman could accomplish what ought to be accomplished in his department. I do not say that this has been done, but I intend to satisfy myself more thoroughly with reference to the matter before arriving at any conclusion.

So far as the sheep and cattle are concerned, I do not accept your reasons for lack of success. I am of the opinion that under the present arrangements sheep will never be managed with success at the institution. You may be able to do it, but for my own part, I could not successfully manage sheep if they were allowed as little exercise as your sheep appear to have at the farm. The yard intended for exercise for these animals has not a solitary hurdle. I noticed last autumn that the yard was filled with manure so that when the rains came it was an entirely unfit spot to herd sheep. I can easily see that these sheep have not had the exercise during the winter that they should have had. They are certainly not in high condition—not as high as my own sheep on my own farm, some of which were, I apprehend, fed grain in greater quantities than yours without any evil result. In fact we have had an extraordinary crop of lambs—fully 150 per cent., good, strong, healthy lambs.

I cannot consent either to the idea that sheep cannot be raised at the farm. Neither can I consent to engage additional land. This would only add to the expenditure, which is already more than it ought to be.

I wish also to state here what I desired to state in our conversation at the College had I had the opportunity, and that is that I wish you to change somewhat your plan of operations so that you may be able to manage the farm with less expenditure of money both for feed and for labor. These are items which sooner or later will be adversely criticized by the farmers generally. I fully consented to the estimate which you made last winter because I was aware that it is impossible suddenly to change the management of a large farm such as we have at Guelph, but I am positive in my conviction that you should not undertake, at least after the present season, to grow so much rape, causing the expenditure of so much money in the purchase of lambs and afterwards for feed to support them. One hundred lambs would answer the purpose quite as well as seven hundred, and if lambs of the proper quality were purchased at the proper season the showing I apprehend would be better than it could be with the quality of lambs you had last year.

The plan of the new piggery has gone forward to the Public Works Department. I do not know what progress has been made with it, but I hope that no arrangement will be made this year to fill up the sheep pens with pigs, as was the case last year. I shall endeavor to hurry forward the erection of the additional piggery so that it may be used towards the end of the season.

Yours very truly,

JOHN DRYDEN,

Minister of Agriculture.

Prof. SHAW,

Agricultural College,

Guelph, Ont.

In his evidence, referring to this letter, Prof. Shaw says: "I never answered this letter directly."

On June 7, Prof. Shaw wrote as follows:

GUELPH, June 7th, 1892.

DEAR SIR,—I proposed replying sooner to your letter of the 27th ult., but the approach of the examinations is always an extremely busy time with us; hence the delay.

Your visit in the meantime and enquiry as to the correctness of my statements in reference to Mr. Barnett and to the condition of the live stock renders a full reply less necessary than it would otherwise be.

In your letter you look upon me as blameworthy that the sheep have not been given more exercise. Why didn't Mr. Barnett give them more exercise? In your desire to bring him here I thought I had a pledge of his competency, and so have given him everything that he asked for in the management of the sheep, except the use of one pen in lieu of another last December. The hurdles were piled up near the barn had Mr. Barnett wanted them.

I notice what you say in reference to changing the plan of operations so that there will be less expenditure for food. No one desires a reduced expenditure more than I, and if you give me a feeder such as I can approve of, I promise you that this will be the result. I entirely concur in your view when you say that you think that we should grow less rape after this year. I have said this to you before. We have grown the rape hitherto largely for the purpose of cleaning the farm. But I desire to call your attention at the same time to the fact that if some food was bought for the lambs that we fed, it was food that gave a good return in every instance, as shown in our published reports. I only wish that all our work here had been equally successful and remunerative.

Your enquiry has not changed my mind in the slightest degree as to statements of my letter of May 11th bearing upon relations with Mr. Barnett and the condition of the live stock.

Mr. Barnett is still charged with having told a certain student that he took his orders from you, although I accept your statement that if he did say this he misrepresented you. I am still convinced that he is largely responsible for the great outlay for food and for the ill success that has attended his labors in managing the same. I said to you in our conversation on the 3rd inst. that I had given orders to put the sheep in a remote field, partly in order to escape the observations of visitors, who seeing them and the absence of lambs with them to a great extent, would lay upon me the blame for this state of affairs. I said to you that in these things I had to bear such blame without being able to justify myself, as it would not be a proper thing to let the public know that affairs had come to such a pass in the management of the live stock. I said to you that I could not say to the public that you were keeping a feeder here in whom I had lost confidence, and whose removal I had more than once asked for, that such a course would not be right, and that I thought it unfair for you to put me in such a position. I still think so. I have no expectation that there will be an improvement while Mr. Barnett is here in his department. I have again, therefore, to ask you to have him removed at an early day, for the sake of the interest of the station and in justice to me.

As I understand, you took statements when here on the 3rd inst. from Mr Barnett, Mr. Whitworth, Mr. Cuppage and Mr. Story in reference to matters bearing upon my department, and also upon my veracity. I now desire to say that I hope you will do me the justice to furnish me at your early convenience with a copy of these statements, including also my own.

Your obedient servant,

THOS. SHAW.

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

And received a reply dated June 9th as follows:

TORONTO, June 9, 1892.

DEAR SIR,—Yours of the 7th inst. is to hand. Several of your letters I consider decidedly impertinent, none more so perhaps than the one just received.

It is idle for you to write me, Why did not Barnett do this or that? He is under your control, and I understood one of your answers to me when at the College a few days ago to be that you had no complaint to make as to his obeying orders. I shall most decidedly hold you responsible for any wrong doing in that department as well as in any other under your control; and I shall expect that you will give your own personal supervision to every department of the farm. *If Mr. Barnett or any other official* in connection with the institution is not performing his duty, he certainly cannot be retained.

I must demand that you point out in writing specifically in what respect Barnett has not fulfilled any instructions given to him by you.

You will remember that Barnett was employed because you wished to dispense with the previous herdsman. You asked me if I knew any one, and I suggested the name of Barnett, which ended in his being employed, and you seemed greatly pleased to get him. It was only last winter in the library of the Parliament Buildings, when we were discussing Barnett, that you decided to retain him for another term.

In reference to the amount of food consumed by the stock under Barnett's care, I desire you to send me a written statement showing the quantities of food consumed during the time that Barnett has been in charge.

I cannot consent to have my time taken up longer with idle gossip as to what Barnett said to some student or some student has said to you. The statement is denied by Barnett, and unless some further proof is forthcoming, I do not desire to discuss it at all.

The request contained in your letter to forward to you a statement of the questions and answers which I obtained in the office of the College while there the other day is, as well as some other references in your letter, a piece of impertinence which I hope will not be repeated.

Yours truly,

JOHN DRYDEN,
Minister of Agriculture.

Prof. SHAW,
Agricultural College,
Guelph, Ont.

Again on October 11th and 12th Prof. Shaw wrote to the Minister the following letters respecting the herdsman's refusing to accept Dorsch as his assistant:

GUELPH, October 11th, 1892.

DEAR SIR,—I think it proper to inform you that the herdsman, Mr. Barnett, called on me in my office this morning and asked if it were true that we were going to send him, Fred (referring to a Prussian in our employ) to-morrow to be his assistant the coming season. I said it was true that we had so decided. He replied, "I will notify you now that I will not accept him as my assistant unless compelled to do so." He also added that he would appeal to the Minister, and unless he (the Minister) decided that he should take Fred on he would not have him.

I desire to say at the same time that this man Fred has labored with us since spring on the farm at odd work, and we found him so obedient, obliging, and so handy at any work that we put him to, and withal so faithful that we do not want to lose his services. We therefore concluded that we could not give Mr. Barnett help that would suit his purposes better.

While I regret very much the action that he has just taken, especially in regard to a man as yet untried by him in his department, I am not surprised very much at the same. You will pardon me for mentioning here that it seems to me the natural outcome of the position taken by you in defending Mr. Barnett against the complaints and charges made by me in reference to him in previous letters, and more especially in your refusal to discharge him when I requested that such should be done. I have, therefore, decided to ask you again to consent to our dispensing with the services of Mr. Barnett in future, and to your giving me authority to secure another feeder who will act more in harmony with the officers of my department.

I need scarcely add that I make this request, as I have made similar ones relating to this matter, with a view to promote the success of my department and also with it the best interests of the institution.

Your obedient servant,

THOS. SHAW,
Professor of Agriculture.

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

GUELPH, Oct., 12th, 1892.

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

DEAR SIR,—I am sorry, indeed, to have to trouble you with letters of this nature, but matters are evidently becoming unworkable, so far as the management of the live stock is concerned.

This morning I went to the stable with Fred Dorsch, the German referred to in my letter to you of yesterday. I told Mr. Barnett I wished this man to help him to feed the stock in the meantime. He said, "I will not have him,"

and added that I need not have gone to the trouble of bringing Mr. Story with me. I said that he had better talk more cautiously or he might have to yield his place. He said that will be as the Minister and Advisory Board decide, and not as you may think.

I think it proper that you should be advised of these facts, and, therefore, have written.

Your obedient servant,

THOS. SHAW.

To which the Minister replied on October 14th as follows :

TORONTO, Oct. 14, 1892.

DEAR SIR,—On my return to Toronto I found your letter referring to the proposed assistant to the herdsman awaiting me.

While at the College I learned from full enquiry that the Prussian whom you propose to place in this position is altogether unfit to make a cattleman, that he has had no experience, nor has he any adaptability for the work. I cannot consent that such a man should be placed in so responsible a position. He should be a man who, if without experience, at least possesses such adaptability for the work as would eventually make him an efficient herdsman, and should be competent, in event of the herdsman being prevented at any time from attending to his duties, to take care of the animals in an efficient manner.

Judging from the information I have received, I conclude that the man referred to could never do this. I decide, therefore, that some more suitable person should be placed in the position of assistant.

I decide, further, that no sufficient reason has been given why the present herdsman—who appears to be efficient in his work and perfectly competent in every respect—should be removed. The work in his department, in my judgment, is altogether too important to be given over to an irresponsible or inefficient man.

Yours very truly,

JOHN. DRYDEN,

Minister of Agriculture.

Prof. SHAW,
Agricultural College,
Guelph, Ont.

On November 1st Prof. Shaw wrote Mr. Dryden as to the feed consumed by stock as follows :

GUELPH, Nov. 1st, 1892.

DEAR SIR,—In a letter received from you June 9th, you ask me to send you a written statement showing the quantities of food consumed during the time that Mr. Barnett has been in charge. I regret that I have not sooner been able to comply with this request.

I was disabled for a time soon after the receipt of your letter, as you know; then the Bursar was absent because of sickness and death in his father's family, then I was away recruiting, and since my return the Bursar has not been able until recently to get the time to look over the books with me.

The following is a statement taken from the Bursar's books of the amounts paid out for food for the maintenance of live stock during the years 1890 and 1891 respectively. In the former of these years Mr. Harvey was the feeder until towards the end of November, and during the latter Mr. Barnett was in charge from April until the end of the year:

Cost of food purchased in 1891	$4,229 11
" " 1890	1,212 76
Difference	$3,016 35

It may also be mentioned by way of explanation, 1st, that, acting on your suggestion, we purchased food to the amount of $1,548.64 early in the year while the price was still fairly moderate. This amount then purchased was supposed to be sufficient for the year, with the exception of some bran and shorts to be purchased late in the season. But in addition to the outlay just mentioned, it was found necessary to expend $2,680.47 more for Mr. Barnett to carry the stock to the close of the year. 2nd. That the crop of 1889 was not very far different from that of 1890; and, 3rd, that the number of animals in Mr. Harvey's time was, if anything, greater than in Mr. Barnett's, as every available stall was filled in the barn stable, and in addition we were necessitated to keep a number of cattle in the horse stable.

I called your attention to what I considered extravagant feeding on the part of Mr. Barnett in a letter forwarded to you under date of Jan. 15th, wherein I said "very much to my regret I realized that our herdsman has largely exceeded the amounts asked for for maintenance of stock on account of what I considered extravagant feeding," and again in the same letter, "he (Mr. Barnett) has exceeded expenditures, as compared with those of the previous year, by some thousands of dollars."

It was on this ground along with others that I asked you to remove Mr. Barnett on more than one occasion.

Any further explanations will be cheerfully furnished.

Your obedient servant,

THOS. SHAW.

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

To which the Minister replied on November 7 as follows:

TORONTO, Nov. 7th, 1892.

DEAR SIR,—I have just received your letter in reply to mine of June 9, asking for a statement of the quantity of food consumed by the stock at the farm for the years 1890 and 1891.

Unfortunately you have not given me a statement of the quantity, but merely of the actual cost of the feed as taken from the Bursar's books. You will see yourself that this does not give an exact idea of what difference there is in the amount of feed consumed in the two years referred to.

Another point about which I would like to obtain information is, am I to understand that the feed purchased in 1891, amounting to $4,229 worth, was all consumed by the animals in charge of Mr. Barnett? If not, how much of it was fed to other animals?

Your letter as it stands at present gives but little light on the point asked for.

Yours very truly,

JOHN DRYDEN,
Minister of Agriculture.

Prof. SHAW,
O. A. C., Guelph.

And Prof. Shaw answered on the 9th as follows:

GUELPH, Nov. 9th, 1892.

DEAR SIR,—I beg to acknowledge the receipt of your letter of the 7th inst. You mention therein that we have not given you a statement of the quantity of the food used in the years 1890 and 1891 respectively, and that we have not stated as to what proportion of it was fed to animals not under Mr. Barnett's charge.

In reference to this I have to say, first, that as the difference in price when we purchased a large proportion of the food bought in 1891 was not very marked as compared with 1890, I did not think it would be necessary to state the quantity bought. I said in my letter of the 1st inst. that "we purchased food to the amount of $1,548.64 early in the year while the price was still fairly moderate." There was some advance in the price later, but it will not nearly account for the increased expenditure. We can get the quantities if you still desire it, but allow me here to say that you will probably get the figures much more quickly by asking the Bursar directly; and when I say this I do not insinuate any shirking of duty on the part of the Bursar. It is only when he is not otherwise occupied that I can get such information.

Second, in reference to the amount fed to animals not under Mr. Barnett's care, I desire to say that the other animals fed, as horses and sheep under experiment, were practically the same as the previous year, and the feeding of these was relatively the same. We had no object in feeding them more heavily.

I cannot but conclude, therefore that Mr. Barnett's system of feeding is chiefly responsible for the increased outlay.

Your obedient servant,

THOS. SHAW.

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

He could not give the amount of feed fed by Barnett to the different animals under his care. He says that no man living could give what amount of increased expenditure was caused by Barnett's feeding, and that, after the end of November, 1891, after he accepted Barnett's resignation, he did not attend the stables frequently. He stated, "I only instructed him once."

Q. Since November, 1891, you have not gone near the stables?
A. I do not say that, but I have not taken the same interest in the stables or in the stock.

Q. Did you think that was right in the interests of the country?
A. I did.

Q. There are four students who go to the cattleman every day, and the assistant has to go through all these cattle, and I say, without any previous knowledge of cattle, that a man between 50 and 60 was not the best man?
A. I did not say he was the best man.

Q. Well, was it not your duty to get the best man?
A. It is not always possible.

"Barnett complained to me about Story's neglect to furnish green feed in the summer of 1891. I spoke to Story about it, and said I thought that green feed should be regularly provided." "The first difficulty I had with Barnett or complaint, so far as I know, was the statement from Mr Story. I had information before that large amounts of feed were being used. I did not notice it so much myself till my attention was called to it."

When asked whether he would accept the Minister's denial of the statement that Barnett was not taking orders from Prof. Shaw but from the Minister, Prof. Shaw states: "I would have to answer that, sir, by a subtle analytical process of reasoning. No; in its entirety I did not accept the Minister's statement that it was not true."

In answer to the question—Do you consider that Barnett was here as a spy upon you? he replied—"Not at first."

Q. Do you now?
A. I do—that is one of the reasons why he is here.

In his examination in reference to the contents of the letter to the Minister, in which he stated that Barnett was directly responsible for the losses of cattle sheep and pigs, Prof. Shaw explained that he did not blame him for all the losses; and regarding a number of the losses his answer was—"I was not sure he was not to blame, because, generally considered, a man was responsible for what he managed." He stated he did not think that Barnett intentionally killed any sheep, or that he intentionally mismanaged them; he, however, added that he did not think Barnett was desirous of doing all he could in the interests of the institution. The reasons for stating that he was responsible for the death and sterility of the cattle, sheep and pigs was that Barnett fed them too high and gave them too little exercise.

In explanation as to preventing Barnett and his assistant from putting boards on the floors of the pig pens, he states the reason was that the weather had got warmer then, and that they did not want all the pens for farrowing purposes; in the next place, because they were unsightly.

He stated that it was impossible to mention to what extent the extravagant feeding went.

He stated that there were more milking cows in 1891 than in 1890, and more sheep fed, and that there was less grain grown; and that the crop was so much behind the ordinary crop that they had to purchase large quantities of bedding.

Q. In June and in November, 1891, the Minister wrote you as to the supply feed, when you had a large number of lambs from Prince Edward Island that required grain and also a number of steers. You know that that year the cost of grain was about double what it had been ?

A. Only in some items.

Q. The price of oats would make about half the difference ; then there were the steers you were feeding, and putting a man on specially to feed them up ?

A. Barnett would feed from 6 to 10 pounds of grain per day—that was a mixture of bran—and the lambs were fed a mixture of oats and barley, according to the bulletin.

He complained about Barnett using too much meal, and in not keeping things tidy. "I am not clear whether I mentioned those matters to Barnett. Barnett complained to me about August 1st ; then after that Story complained about Barnett. Story began to talk against Barnett before Barnett spoke about him."

On 29th October, 1891, the Minister wrote Prof. Shaw a private letter, in which he states as follows :

Private.

TORONTO, Oct. 29th, 1891.

DEAR SIR,—When I was up at the farm on the day of the plowing match I learned from Barnett, the herdsman, that he contemplated leaving his position. It may be that I do not view the matter as you would, but to me this would be very unfortunate, as it is not easy to get a man who understands the work of managing all these bulls and the cattle and the sheep generally as well. I know his disposition is perhaps a little peculiar, but with fairly reasonable treatment I do not think that there need be any trouble with him. I think he would be contented with his position if things were made pleasant. From some conversation with him I find that his position does not appear to be as pleasant as it should be. It has occurred to me that perhaps we might make a new arrangement which would make matters go smoothly in connection with his department. I thought that as Mr. Zavitz has control of Mr. Cuppage, he might, in a formal way, assume control of Barnett, and leave Mr. Story to look after matters outside alone. Something of this kind will have to be done, or I apprehend we shall not be able to keep Barnett in his position.

I should be glad if you would immediately write me a private note giving your judgment as to whether this could be worked satisfactorily to all parties. I should prefer that you would not mention the matter to any of the parties named until after consultation with me in reference thereto.

Yours very truly,

JOHN DRYDEN.

Prof. SHAW,
Agricultural College,
Guelph, Ont.

Prof. Shaw, some time after receiving it, informed Mr. Story of its contents. In answer to this letter Prof. Shaw wrote opposing Barnett's being placed under Mr. Zavitz.

On November 19th the Minister again wrote Prof. Shaw as follows:

TORONTO, Nov. 19th, 1891.

MY DEAR SIR,—In our conversation of yesterday I omitted to suggest that should you require to buy hay, as I suppose you will, it will be better to purchase it early in the season than later on. Owing to the present state of the weather, I presume that the five or six hundred lambs you have will have to be fed for some considerable time on hay and oats. If I am right in reference to this, I suggest that it would be better to buy hay now rather than to use our own entirely up and be obliged to buy for our own stock later on in the season. The only difficulty is that I am very anxious that accounts for expenses of this sort should be as few as possible until the end of the year, as you will notice that the account for farm maintenance is altogether overdrawn.

I hope you will be able to arrange so that Barnett will have feed regularly supplied him, so that there may be as little friction as possible. I think you will find he will be pleasant enough if he has the required supply of all that is needed. Sometimes it is difficult to do this, but I think the effort should be made. I questioned him closely yesterday as to feeding, and from what I could gather the bulk of the feed is being given to the milch cows and the experimental stock. He tells me that he has not fed the other cattle scarcely half the quantity of grain. It is certainly very essential that the cattle kept for educacational purposes should be in good condition, and it is still more essential that they should be in good condition for the sake of those visiting the farm from time to time.

I was very much pleased with the way the sheep looked when I went through the sheds after seeing you yesterday. It is quite a pleasure to look at animals cared for in that way. But I was equally disgusted with the look of the pigs in their pens. They did not seem to have been properly supplied with bedding nor with feed. It is certainly no credit to any of us connected with the institution to have them in that shape, and I trust you will immediately give attention to it so as to remedy the matter as far as possible.

. . . . . .

Yours very truly,

JOHN DRYDEN,
Minister of Agriculture.

Prof. THOMAS SHAW,
Agricultural College,
Guelph, Ont.

J. E. STORY, Farm Foreman.

"Prof. Shaw has said that Barnett was not a successful cattleman. I would say Barnett is not a satisfactory man in many respects. In 1891 and 1892, we had a great deal of feed to buy and bedding; and I often thought he could do with less. I purchased the feed with Prof. Shaw's assistance. The cattleman wanted it, complained about not having it, and I purchased it. A good man can economize. I think he could have done with less feeding. There was a good deal more bedding used than was wanted. I think a sharp man, buying out of

his own pocket, could do with less. Men who have to buy at all do without. He used about half or one-third too much. Barnett did not pay any respect to what I said. I did not superintend how much he fed the cattle. I simply sent a note to Prof. Shaw telling him that I did not want to be responsible, as Barnett paid no attention to me. I think he was accustomed to show stock, and was feeding more than was necessary here. The boys were noticing it. He refused to carry out my instructions in serving the bedding. I cannot recollect any other thing. Bedding seems to be the only instance in which he disobeyed. I cannot tell how much bedding I bought. It was not all used in his department. We purchase for the Dairy Department, for the horses, cattle, sheep and bulls. Barnett has 30 cattle, 8 pigs and 40 sheep. In the Experimental Department there were 9 pigs, 18 cattle and 2 sheep. In the Dairy there were 14 cows and some calves, there were also 17 horses. Barnett paid attention only to his own department. Other persons attended to the cattle, sheep, pigs and horses in the other departments. They all required bedding and feeding. I think he used nearly three-quarters of the bedding. He piled it into the box stalls; there were 18 of them. The teamsters, as a rule, took very good care of the bedding. I raked them over occasionally about it. I used to warn them in the morning not to throw out anything but what was dirty. I used to go to Barnett and state to him to warn the boys not to throw out the bedding, but he would not do it. The oat and barley straw was very short in 1891. We were a little shorter in bedding than in former years. I wrote to Prof. Shaw complaining against Barnett in November, 1891. I was annoyed, because a short time before I had spoken to Hon. Mr. Dryden and he had paid no attention to it. I did not give orders to Barnett before writing; none that I could help. I do not think I gave him any really direct orders from the 6th November, 1891, to the present time. I avoided the thing as much as I could, when the Minister told me he was a competent man. The Minister did not tell me that I must not give him orders nor did Prof. Shaw. I thought I would try to keep things running as peaceably as possible. I cannot say how much unnecessary feed he used. I believe some of the cattle got too fat. I cannot tell how much he fed them too high. He fed too much grain, but how much I cannot tell. I remember chopping 65 bushels of oats and it was all gone in four and a half days. He fed the sheep hay, oats and bran. He fed to a beast from four and a half to five pounds of hay, four or five pound of roots and up to five pound of grain, and no grain to cattle that were breeding, only roots and hay. A cow that is milking you want to feed well. I do not know exactly what was fed to the cattle that were fed too high. I do not know that there was a great deal wasted that the cattle did not eat, because they ate good feed when a less ration would do. He should have fed pea straw instead of hay to the sheep. I told him so in the fall of 1891. They were too fat and all the lambs died. He has been more economical since last fall. He is feeding too much swill to the pigs. I do not like to see pigs rooting it out and wasting it. I do not think he is feeding as much to the cattle as he used to. He has got them into good condition and it is easier to keep them. You cannot keep milch cattle in too good condition. The Polled Angus, the Galloways, the Jerseys and the Herefords are pretty fat. It might possibly be that the feed costs more one year than another. Dr. Mills called me one day and said, 'How is it, Story, that there are three or four men in the stable and it is not any tidier than when Parker was there.' I said, 'Mr. Dryden seems to think our man is all right, and we cannot say anything about it.' Last fall Barnett refused to take a man named Dorsch. I was with Prof. Shaw at the time. Barnett said, 'I won't have him.' He asked me, just before Whitworth, his old assistant, was leaving, who his assistant would be. I said I thought it would be

one of two men, Dorsch or some one else. He said, 'He is not much; he is afraid of the bulls.' I told Prof. Shaw about it. Their breeding has not been as fruitful since Barnett came here as before. We had more cases of non-breeding last year than before. As a result, we do not have the young stock for sale we otherwise have. He has been accustomed to feeding for show purposes and does not suit the Agricultural College. I cannot give any approximation of the quantity fed before and after Barnett came. As to the feed bin, when the test commenced, I said to the teamsters, 'I do not want a single man of you to go to that corner I want to see how much you are feeding and how much the cattleman is feeding.' Then I spoke to Cuppage, because, I said, I want to see how long that 65 bushels of oats will do. We put the 65 bushels of oats in on Monday night, and on Friday noon there was no oats in the bin. The teamsters would have no object in carrying the feed down, when they had it beside them. At that time every man brought his own grain, but I often thought they fed more than I told them to, and that was why I spoke to them. We know the exact number of pounds our horses are fed every day. I did not tell Barnett anything about it. It was something more than three times as much as under Harvey, the previous herdsman."

BARNETT'S evidence in reply:

Barnett, in his evidence, stated that he commenced his duties April, 1891. Agreement was that he should take his orders from Prof. Shaw and Farm Foreman Story. In the fall of 1891 there was a difficulty with Story on account of not getting green food when he wanted it. No instructions ever received from Minister or anyone, other than Story and Prof. Shaw. Never said he was taking instructions from Minister; he heard it repeated and denied it. Never told Story or any student that he was not under Prof. Shaw's instructions. When assistant was leaving he went to Story and asked for another. Afterwards Story told him he could have Dorsch, who was working on the farm, and they had promised him work for the winter. Story came on Monday and said Dorsch would come about Wednesday. He knew Dorsch would not do and said so. He went to Prof. Shaw and asked him, and he said Barnett was to have him. Barnett said he would not have him until the Minister made him. Prof. Shaw said he would have to, and Barnett left him at that. Next morning Dorsch came to the stable and Barnett told him he was not his man yet. Dorsch said Story sent him. Next morning Story brought him and Barnett refused to have him because he was not a fit man. He had him in the spring four or five days and found Dorsch was afraid of the cows. He saw one of the calves put him out of the stall, and concluded he would be no use among the bulls. He was 50 years of age.

As to driving the cattle up the lane, Barnett said, "Prof. Shaw came to us one day and told us about the time we would have to start taking the cattle around by the road. The day before we were to stop taking them up the lane, Story came along and said we could take them up that way another day. As long as Prof. Shaw was working at the upper end of the lane we thought it was safe to drive up, but he came along one day and told us not to go, and from that day it was not done."

As to the sheep pen. "Prof. Shaw came along one day and asked for a close pen; he was going to try experiments with sheep shorn and unshorn. I told him I was having sheep lambing and to take the next pen; I had got this pen all clean and thought I had a right to it." He said, "Supposing, Joseph, I say I am going to have the pen?" I said, "You have the authority aronnd here, and if you say it, you get the pen and I do not." I handed him my resignation

and sent it to the Minister. It was understood any party could break the agreement with a month's notice. The Minister came up about the 1st of September, and I promised I would stay until the 1st of October, 1892. After I sent my resignation, Prof. Shaw was down to Toronto, and when he came back he told me I was wanted down the next day. The Minister told me he and Prof. Shaw had talked the matter over, and I was to stop, if I would agree to stop. Prof. Shaw met me in the bull stables one day and said he had made up his mind to make things more agreeable, and seemed to want to improve the live stock. I expected things were arranged satisfactorily for the future. The reason I did not give up the pen was because I had not enough confidence in what he told me; he promised things before that he did not fulfil."

Referring to the death of the young pigs as they were being farrowed, he said it was on account of the cement floor, and when boards were put on the floor he saved them. "Prof. Shaw called my assistant up to his office and asked him who gave him authority to put boards on the floor. My assistant told him that I had told him to do so. He said, do not do so any more." After that we saved 46 out of 54 pigs. I do not say we would not have saved more on the cement floors than we had done before, because the weather was getting warmer.

Q. You have no record of what was done before you came?

A. I have an old memorandum here before I came, on March 2nd, 7 pigs, of which 5 died.

Q. How did you come to get this record?

A. This was a cattleman's diary given me when I came. That Berkshire sow had one pig when I came here. Yorkshire sow littered 8 pigs, of which 7 died.

He says, "I did all I could to save bedding. I do not believe there is economy in poor bedding or poor feeding." Sometimes the students did waste the bedding; sometimes too much straw went, but not daily; used poor straw, some oat straw, and when he first came some barley straw for bedding, it cost $2.50 a load; there were 5 or 6 loads bought the first summer.

As to the feeding, he says Professor Shaw told him when he came there to have everything presentable—people believed much more in them, and he left him at that. "I fed as I thought about right, and I do not think yet I fed too much." Fed grain right along—did not feed as high here as at his former place and they were for breeding purposes. Did not remember Professor Shaw telling him he was overfeeding. "I do remember Mr. Story telling me Professor Shaw said we were using too much feed. It was principally milch cows I was feeding. I took it for granted they were not being fed too much; I believe in feeding a milch cow to her full capacity." The teamsters were feeding—going to the same bin for feed and he believed out of the same bin mentioned by Story; there were seven teams and two cart horses. Generally speaking the bins were filled on Sunday morning, and they got it as they wanted it. Have not changed feeding since last October. The milch cows have been fed just as heavy as before; was hampered the past season by Mr. Story in not getting in feed and not cutting it when it was in. When spoken to he said, "Oh, I have not got time," and then putting Dorsch on him would have hampered him. He stated, "I think I could have got along better if Professor Shaw had told me more what he wanted, if he had instructed me; Mr. Dryden did not tell me what I was to do." Went to the horse show at Guelph, not knowing about the rules; that was in the spring of 1892. Did up the yards and went away about two o'clock, and came back to look after the cattle at night.

Q. You heard Professor Shaw state that he believes you are here at the request of the Minister as a spy upon himself ?

A. Yes; I know nothing of it: I have never been asked or spoken to about Professor Shaw, nor as to what others were doing. It is a slander upon myself and the Minister.

Q. Did the Advisory Board ever complain to you about uncleanliness ?

A. They never did. Mr. Story has occasionally told me to sweep up a corner or pick up something; he has never said I kept the stables untidy. The cause of some of the dirt is the throwing of food down from above and a lot of dirty bedding came down. About that particular bin, it was filled in April, 1892; I never heard anything about it till now. I swear straight and plain that I did not feed it in that time nor was it fed in that time under my directions.

Q. Did you see whether the teamsters took anything from that bin from April, 1892 ?

A. Yes; all that summer.

Q. How many pounds do you usually feed ?

A. Never more than ten pounds. I had four cows that winter that came in thin and I was feeding them that. Some I was feeding as low as two or three pounds. I think I was averaging six or seven pounds for the 33 animals—say 245 lbs.—that is less than 8 bushels a day. Even if I had fed ten the bin would not have been emptied in that time. I would have had to feed nearly twenty pounds a day—they would not live long on that. "I fed the Angus and Hereford that Professor Shaw says are in first-class condition."

Dr. F. C. Grenside, V.S.: Had charge of the Veterinary Department for ten or eleven years. He came into contact with the cattle more particularly. He presented the Report in the Annual Report of the College for 1892, page 33, in which he says:—"To the President of the Ontario Agricultural College, Sir—I beg to submit my annual report for the year 1892. During my eleven years' connection with the College, and professional attendance upon the stock of the farm, I have never been called upon for so little veterinary attendance. I attribute this comparative immunity from ill-health as due to the remarkable keenness of observation, vigilant care, and intelligent management of Mr. Joseph Barnett, who has the cattle, sheep and swine under his immediate care."

In his examination, Dr. Grenside stated that that was an honest and truthful report, and that he believed it to be so at the time he drew it up. He formed his opinion from observation, and noticed that if there was anything wrong with the cattle, Barnett was very quick to observe it and that he followed out his instructions in the treatment He was one of the very best nurses he ever had with animals; and considered him a faithful herdsman. He further stated that Barnett did not overfeed more than had always been done—that in his opinion there had always been overfeeding, but not unnecessary feeding, with reference to the position the institution held in the country. There had been one or two efforts to cut down the feeding. The people who visited expected to find the animals in show condition; and the average man was disappointed if he did not find them so. He said he he had an impression that there was overfeeding before, but that it was justifiable under the circumstances. The position he took was that it was necessary, seeing the position the farm held in the Province, considering the nature and objects of the institution. Barnett always obeyed his orders very faithfully, every time. He noticed that with some of the former herdsmen the cattle did not eat cleanly; but in Barnett's time they did, and it was a sign that there was

no waste or, at least, very little waste. He thought Barnett had been as successful as as any former herdsman in his treatment of the animals here; and did not think he had been the occasion of the lack of increase in the animals since he came, nor that he had brought such a thing about from overfeeding; and considered want of exercise had often more to do with that than overfeeding. In the case of Shorthorns, he thought overfeeding often prevented breeding and was inclined to think there was more sterility among them than among other breeds. He did not think Barnett had been less successful with sheep than was formerly the case. There was quite a number of lambs lost. One cause had been that many of the animals brought here were show animals. He often discovered that lambs were in a weakly condition before Barnett came. He did not mean to say that he was not keeping them fatter than he would on a farm of his own, but he did not think that he was keeping them fatter than the public demanded and such an institution as this required.

Q. Barnett stated that in cold weather the pigs farrowed on a cement floor, and then when he covered the floor with boards he did not lose so many.

A. That would be quite reasonable. He stated that if a man afraid of the cattle was appointed assistant, he would be a very bad one, in this way, that he would very likely abuse the cattle according to his fear. He saw no reason why, in these grounds, the sheep could not get proper exercise. It would depend upon the cattleman's instructions—it would not be his fault if they did not. In answer to a question from Professor Shaw's counsel, he said, "I had no communication with the Minister of Agriculture in reference to this report before it was made up. It is the disinterested expression of my own mind at the time."

John I. Hobson, Chairman of the Advisory Board: I think that Barnett is an excellent cattleman. On my occasional visits to the farm, I have paid particular attention to the way he keeps the cattle, sheep and pigs. I consider him good in this way, that the cattle have that healthful, smooth, oily look about them that only practical men can induce. Then, there seems to be a familiarity between the cattlemen and the cattle. As an extensive stockman myself, I would speak strongly on this point. I would not have a man in charge of my stock unless he were quiet, kindly and the stock were not afraid of him. I have not seen any evidence of his overfeeding. At the Government Sale last fall, I bought two of the breeding cows and have now got them at home on my farm. The impression was that they had been overfed and would not breed. As soon as we got them, we purposely fed them poorly, and, to my surprise, after being put upon short rations, I think that one of the cows is actually fatter to-day. I mention this to show that these cattle were not overfed, or they would have been fatter than they were when I bought them. An assistant afraid of the cattle should not be there at all. I would not have him on my farm. It is a very important thing, especially about bulls: there is a certain instinct that enables them to tell a man who is afraid of them. Barnett is tidy in looking after the cattle. I have been here when he could not by any means know of my coming. I have found the management good, so far as I could judge. I have no reason to think that the pigs were overfed. They had not the appearance of being overfed. I have seen them frequently. The sheep did not appear to be overfed. I think the germs of disease have been in this farm, ever since the Government owned it. I have talked this matter over with expert sheep raisers, and it was their opinion also.

If the sheep were covered with ticks the man in charge might be neglectful; I would not say that he is not efficient on that account. My sheep have ticks. I handle sheep largely and have about the best averages in the country around.

I have never applied a remedy for ticks in twenty years; they were not much the worse for them. This has been an exceptionally fatal year for pigs over the whole country. At the last Board meeting the question of stock came up. I thought that Prof. Shaw was anxious that Barnett should be dismissed. It was a question, I think, not altogether confined to the matter of inefficiency. A man was appointed to assist him whom, he had good reason to believe, should not have been connected with the work at all. Mr. McMillan, as well as other members of the Board, was very strong on this point. He said it was wrong to engage anyone who had no adaptability for the work, and he gave illustrations of the great mistakes he had made in his own herd in this way.

I think it would have been a great mistake to discharge the cattleman here. I think it was altogether unreasonable to ask him to take an incompetent man as his assistant, and we were guided largely by that. We thought that that man was being forced upon him. The Board did not at any time make any complaint against Barnett about the uncleanliness of the stables.

F. B. LINFIELD: "Whether Barnett overfed or wasted the feed is a matter of opinion; what some would call overfeeding, others might not. Some writers upon the subject state that high feeding interferes with the fecundity of breeding stock and the same way with regard to the sheep.

The cattle seemed to me to be in what I considered show condition. Breeders often refuse to show on account of the fact that feeding degenerates the animals"

Dr. MILLS, in his evidence, stated: "The feed accounts must have been less in 1888, but we had to buy feed after the barns were burned. In 1891 and 1892, I think it is only fair to say, with regard to the large increase, that I cannot understand how anyone with any conscience left can attribute all this to the overfeeding of one man. I think anyone would know that there was too much land put into rape and that there was not the usual amount of hay, oats and peas. The Bursar's book will show what money was paid for hay and straw. It was the talk of Guelph that they bought nearly all that came upon the market. There was very little grown on the farm."

Dr. MILLS to Mr. STORY: It was you who first complained to me about Barnett not keeping the stables tidy.

A. I did not say anything about Barnett.

Q. You said to me there are two cattlemen in the stable now and it is not as tidy as when Parker was here alone.

A. I remember remarking on one or two occasions that the stable was not as tidy as I would like.

As to Cutting down the Estimates.

In reference to cutting down the estimates, Prof. Shaw stated: "I will say that to this present year Mr. Dryden has treated us very liberally. This year he cut down the estimates a great deal. A short time before the estimates were made out for 1893, a young man living in Guelph named Walsh came to my office asking if I could not give him some employment in shorthand and typewriting. I found he could take notes readily. He wanted $3 a week. In conversation with Mr. Zavitz we found it would be a prudent thing to put in an estimate for assistance of that kind, and put in an item for $200, and if I remember rightly, an item of $100 for the typewriter; and when we came back from the Institute meetings I went to Toronto to see Mr. Dryden about it. He

said if he gave me assistance of that kind that the other Professors would be equally entitled to the same: and, among other things, I told him that they had not anything like the work, and if I got that assistance that the expenditure would be several times repaid back to the farm by the more efficient work that I could do."

Purchase of Stock in the Old Country.

Prof. Shaw stated in his evidence: "In 1891 the Minister went over to purchase stock and purchased a good many animals that I never made a recommendation for. My objection was not so much to his buying the animals, because I knew he had a perfect right to do so; it was the fact of his buying them and then writing me such a strong letter blaming me for over-expenditure for which he himself was responsible. The purchasing of the large amount of sheep which overran the estimate was owing to a very large crop of rape."

Q. Then you and the Minister had a discussion about the purchase before he left?

A. I do not remember.

On the 9th July, 1891, the Minister wrote Prof. Shaw as follows:

LONDON, ENG., July 9, 1891.

DEAR SIR,—Your letter which missed me at Brooklin reached me some days ago, but I have not had a moment earlier than this to reply. I find I undertook too much when I proposed to purchase so many kinds of sheep and cattle in so short a time, as they are scattered over so many portions of the country.

I have secured specimens of Red Polled, Ayrshire, Galloway, and talk of Sussex instead of Devon, as they seem to me to be much more useful. I may also bring a Guernsey or two. I have also purchased three Tamworth pigs, two sows and one boar, all suitable for breeding next autumn.

In sheep I have South Downs, Shrops, Border Leicester, Hampshire, Oxford and Sussex. I have yet to secure the Dorsets. I am omitting Cotswold for lack of time and we can supply them another year if necessary.

The cattle cannot be brought at present, but will need to come later. The sheep will be in charge of John Campbell, of Woodville, and leave July 17th from Liverpool.

I have considered your proposal to purchase lambs in Prince Edward Island, and with your explanations have decided to consent to your proposition. You may, therefore, proceed with any arrangements necessary for carrying it out. I expect to be home about the 25th of this month.

Yours truly,

JOHN DRYDEN,
Minister of Agriculture.

Prof. THOS. SHAW,
Guelph, Ont.

On the 3rd June, 1892, Prof. Shaw wrote the Minister as follows in reference to the purchases of stock in 1892:

GUELPH, June 3, 1892.

DEAR SIR,—In answer to your letter of the 27th ult., asking what purchases of live stock should be made during the year, I beg to state that it would be desirable to have the following pure bred animals purchased for the farm this year, providing the funds used for it will not overdraw the estimates: One Suffolk ram, one Leicester ram, one Yorkshire boar one Sussex bull, one Shropshire ram, one Dorset ram, one Shorthorn bull, one Lincoln ram and four ewes, one Cotswold ram and four ewes. There is an estimate for the first named three animals of $275. I therefore recommend that they be purchased. For the others there is no estimate, as at the time the estimates were made it was not known or expected that they would be required. But there is an estimate for Poland China, Chester White and Duroc-Jersey pigs, and also for a Guernsey bull, to the extent of $800. I would recommend, therefore, that the other animals named be purchased so far as the $800 named will accomplish this, and in the order in which they are named. This sum should also cover the cost of transit, that the estimates be not overdrawn.

My reasons for proposing to use the $800 in this way are that we can do without the Guernsey bull this season much better than some of the other animals named, and that it is possible the piggery may not be completed early enough for the reception of the pigs mentioned. It would be unwise to bring them until a place was ready, owing to the overcrowded state of the present piggery.

I would also recommend that all these animals, so far as they may be purchased, should be bought in Great Britain.

Your obedient servant,

THOS. SHAW.

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

In his evidence Prof. Shaw states:

Q. So that the only thing he bought that you did not ask for was a Guernsey bull and an Oxford ram?

A. Yes.

Q. So he really was guided by your recommendation?

A. As to the animals bought but not in reference to the price.

Q. Who purchased them?

A. I do not know. I know that the man that brought them over told me that Mr. Bruce bought them

The Cutting out of Bulletins.

In reference to his grievance relating to the bulletins, Prof. Shaw said:

"There was a very important bulletin that the Minister did not publish at all—it was on corn culture and the silo. Mr. Zavitz and I spent a great deal of labor in preparing it. We had used all the material from previous experiments of the farm; and Mr. Zavitz had obtained information from a large number of Americans, relating to their experience. I went to Toronto and talked with Mr. James—not especially about this bulletin—but in conversation, I told him that we were preparing this bulletin and expected to have it ready in a short time. He said nothing definite then. A short time after a circular came from Mr. James asking for information in regard to growing corn and the silo. A day or two before, Mr. James had written me a letter asking me to give him the names of farmers in Ontario who had silos. I did so. I did not know why he wanted the information. If he intended not to bring out our bulletin, we should have been told not to go on with it."

On March 25th, 1892, Prof. Shaw wrote the following letter to the Deputy-Minister of Agriculture:

GUELPH, March 25th, 1892.

DEAR PROF. JAMES,—I have just handed to the President a bulletin on corn, the silo, and ensilage. You will remember, please, that I mentioned to you when in Toronto last, on March 11th, at the meeting of the Agriculture and Arts Association, that we were getting up a bulletin on corn. Last Saturday, when I was lying ill, I received a circular addressed to Prof. Dean inside, saying that you had been commissioned to get up a bulletin on the subject. Ours was then approaching completion. I would have sent the same to Prof. Dean, but Mr. Story told me that Prof. Dean had got one and had been questioning him (Mr. Story) as to our methods, that he might be able to answer the questions. I suppose you are aware that the work of growing the corn in the field and in the experimental plots was entirely carried on by the farm.

I am glad the Minister is gathering material and that you are to prepare the bulletin; for if the two are issued together, as I hope they may be, the farmers who get the bulletins will be well equipped for growing corn, building silos and making silage.

Shall I still answer your questions? Please oblige by letting me know if the corn bulletins will come out soon, and if they will appear together.

Yours truly,

THOS. SHAW.

Prof. C. C. JAMES,
Deputy-Minister of Agriculture,
Toronto, Ont.

On March 28th, the Deputy-Minister replied as follows:

TORONTO, March 28th, 1892.

DEAR PROFESSOR SHAW,—I have just received your letter of March 26th, also your copy of bulletin from President Mills. Some time ago I was instructed by Mr. Dryden to obtain information from all the principal silage producers in Ontario, and from their replies to make a bulletin. These answers are coming in every day, and I hope in a few days to put the matter in shape for publication.

The circulars to you and Prof. Dean must have been interchanged. I have a bulletin from Prof. Panton which came to hand a few days ago, and which will have to precede yours. I have not yet had time to read your bulletin carefully to see whether it covers exactly the same ground as the questions which I have submitted. It would appear strange, of course, to send out two bulletins upon the same subject unless they supplemented each other. However, I shall read yours at once and give you the Minister's decision in the matter in a day or two. Your answers to our questions will doubtless be contained in the bulletin.

Yours very truly,

C. C. JAMES,
Deputy-Minister of Agriculture

Prof. T. SHAW, O. A. C., Guelph, Ont.

On March 30th, Mr. Dryden wrote as follows:

TORONTO, March 30th, 1892.

DEAR SIR,—Mr. James has just informed me that you have sent in a bulletin on the growth of corn for ensilage, etc. I cannot promise that this bulletin shall be published. I have no doubt that you were fully aware that we were preparing to furnish all the information that could be gathered up to the present time on this subject for the benefit of the farmers. This work was started last autumn and will be carried on to completion. Should it appear that your bulletin fully covers the ground which we desired to cover, it may be published, but there will be no necessity, I apprehend, for publishing two bulletins on the same points.

You will remember your repeated complaints to me about your being overworked in this line. I therefore thought we might manage this and relieve you of this much strain; but it appears after all that you do not desire sufficiently to be relieved to prevent you from pressing upon us a bulletin upon a subject concerning which you knew some time since that we were gathering information for publication.

I have not yet examined your bulletin, and if it contains the experience of the farm in reference to this matter, it will be quite proper that it should be published; but if it is merely written in the form of an essay, the Department may only use such portions of it as will assist in making clear to the farmers the points in connection with the matter discussed.

Yours very truly,

JOHN DRYDEN,
Minister of Agriculture.

Professor SHAW,
Agricultural College,
Guelph, Ont.

On April 2nd, Prof. Shaw wrote as follows:

GUELPH, April 2nd, 1892.

DEAR SIR,—In answer to your letter of the 30th ult. referring to the bulletin sent by me to your Department for publication on corn and silage, I beg leave to state that the second paragraph therein is a mistake, as the first intimation I had that you were getting information on the same subject came to me on the 19th of March.

The further information contained in your letter that a bulletin prepared by your Department will be carried to completion, affords me ground to hope that it

will be of immense benefit to the farmers. I have no doubt but that there will be a similarity in some particulars in the two bulletins, as some of your correspondents wrote to me for information upon the subject, stating that such information was for your department, although without any intimation as to the use to which it was to be put. Allow me, however, to express the hope that you will be able to find in our bulletin sufficient to warrant its publication. I can assure you that it has been prepared with great care and with the desire of furnishing the most information in the least possible space. If you do not see fit to publish it in its entirety, may I ask of you the favor not to publish fragments from it, as the intention was to make it one complete whole, which should cover in as small a space as possible the whole ground of the corn question.

I would call your attention to your remark as to my complaint of being overworked in this particular line. I beg to say that in the press of business, you have overlooked the fact that my complaint was as to excessive clerical work of a merely routine character.

I regret that you should harbor the impression that I am "pressing" upon you a bulletin when I knew that you were preparing one of a similar character at an earlier date than I have mentioned. In this you do me a great injustice.

I think you will find that much that is in our bulletin which was sent to Toronto is based upon our own experimental work. We did not know how these results cou'd so well be got before the public as in bulletin form, and this is our principal reason for writing it.

Your obedient servant,

THOS. SHAW.

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

On April 29th Mr. Dryden wrote as follows:

TORONTO, April 29th, 1892.

DEAR SIR,—Mr. James has handed me your letter requesting an immediate return of the manuscript of the bulletin on the silo. The manuscript covers precisely the same ground as had already been written up under my instructions in the department, and, therefore, we decided not to publish yours in addition. The manuscript is returned herewith.

Yours truly,

JOHN DRYDEN,
Minister of Agriculture.

Prof. SHAW,
Agricultural College,
Guelph, Ont.

Prof. Shaw in his evidence stated:

Q. Regarding the bulletin that the Minister did not issue, you heard that the department was getting one up on the subject at the Central Farmers' Institute?

A. I do not know.

Q. Was there anything about the bulletins excepting the delay?

A. I could not get any very considerable number of bulletins to distribute.

Q. Were you entitled to them?

A. I naturally expect that after my getting them my there should be no serious objection to giving me one hundred or two hundred to distribute. I wrote about it, and he said it had been decided to give ten copies to each of the members of the staff, and that he saw no reason why I should have special privileges.

On March 16th, 1891, he wrote to the Minister as follows:

"I have asked for three hundred copies of my bulletins, nearly all of which are for distribution in this office, as parties may ask for them. I made this request through Mr. Mills, the President, some weeks since; and I understand that he forwarded my request, but as yet I have not received the bulletins. I may mention now that two hundred of each would probably be sufficient, as the students can get them directly from the President. I hope you may see your way clear to meet my wishes in this matter. It makes no difference to me whether they come direct or otherwise so long as I get them."

On March 18, 1891, Hon. Mr. Dryden wrote as follows:

. . . "In reference to the number of copies of bulletins to be sent to yourself, I have been trying to arrange for a satisfactory manner of distribution all round. It is useless for us to duplicate these bulletins. I think that a copy of each bulletin issued should be given to the students, but they should be distributed from the President's office and not privately from the persons who may be engaged in compiling them. It is possible that each of the professors may have a few personal friends who would not receive them except from their hands, and to meet such cases it is right that a limited number should be allowed. You will easily see that if we give a large number to each professor, we are liable to have complaint made, and I really would not know how to defend the matter. It is from a public standpoint, of course, that I take the action I do in this matter. When Mr. Mills was here, he and Mr. Blue made out some arrangement as to the number to be sent to the College, but I have not made enquiry as to the outcome of their conference, and Mr. Blue is at present out of the office. There should be no difficulty in Mr. Story or Mr. Zavitz, or any of those persons who need copies of the bulletins, receiving them through the President. I can see no necessity for two or three hundred being sent to yourself to be divided among some of the other professors and teachers. It seems to me that they ought all to get them from the same source."

In his examination Dr. Mills gave the following evidence upon this subject:

Q. What about the insufficient bulletins sent to Prof. Shaw?

A. The Deputy-Minister wrote me that they wished to distribute from Toronto, because they had the franking privilege and we had not. He said they would send us one hundred, and that one was to be given to each student—then you will have a small number on hand for anyone else who wants them. Then they sent a certain number to each professor. When I receive applications I frequently send them to the department—they have the regular mailing list, and can look after the matter better. I do not see why Prof. Shaw could not do the same.

As to the grievance of Prof. Shaw respecting the cutting out of bulletins on March 6th, 1891, the Minister wrote as follows:

TORONTO, March 6th, 1891.

MY DEAR SIR,—Mr. Blue has submitted to me the file of correspondence between yourself and him relative to the calculations in your last bulletin. Without going into any argument in reference to the matter, I desire to say that the last table given, in which you show "gain or loss" and also "gain or loss

per cent.," is likely to be misleading unless one of two things is done—either the percentage changed, according to Mr. Blue's contention, or the statement itself changed. To anyone reading the table the conclusion would be certain that you had expressed a mere gain or loss in two different ways: first, you give a definite sum, and, secondly, you give this sum by percentage; but it appears in your table that you arrive at these two statements by an entirely different process. It seems to me that a gain or loss must be the same whether you compute it by percentage or by any other way. It may be that you are not so well aware as I am that these bulletins are scanned very closely and criticized sometimes very severely. I am anxious, therefore, that no bulletin should go out which is not clear and distinct as to its teaching. With the light I have at present I cannot, therefore, understand why you wish to insert the figures in the table as proposed. I have read your letter addressed to Mr. Blue, but it does not make the matter clear to either of us. We shall withhold the bulletin for further explanation.

Yours very truly,

JOHN DRYDEN,
Minister of Agriculture.

Prof. THOMAS SHAW,
Agricultural College,
Guelph, Ont.

On March 9th Prof. Shaw replied as follows:

GUELPH, March 9th, 1891.

DEAR SIR,—Your letter of the 6th inst. is at hand. I notice what you say therein in reference to the difference of opinion between Mr. Blue and myself in reference to the mode of stating the percentages in the last table of the bulletin on swine feeding, which is now in type. I regret to learn from your letter that I failed to make myself clearly understood in the explanations made therein on the subject of Mr. Blue. I would be glad to put my explanation in any other form that would more clearly convey my ideas, but the way of doing so has not as yet occurred to me. When you mention that "those bulletins are scanned very closely and criticized sometimes very severely," you touch upon the reasons of my great anxiety also to have them go out in what I consider the best form, especially when I remember that I will be held responsible for their utterances.

Mr. Zavitz and I discussed the question as to the basis of the computation of these gains and losses per cent. before issuing Bulletin L. By consulting the last table of that bulletin, you will see the mode of computation adopted there which is an exact parallel, and we were so well agreed in reference to the matter, that we decided to adopt it in our computations of this nature.

It is apparent, therefore, that it is a question on which there is a decided difference of opinion between us, and I have no doubt that these opinions are honestly held. In view of this, I would respectfully suggest that the printers' proof be returned to me, when I will so change the statement, as suggested in your letter, as I trust will make it meet with the approval of all parties.

Your obedient servant,
THOMAS SHAW.

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

On March 10th, Mr. Dryden, returning the proof of bulletin for correction, stated :

TORONTO, March 10th, 1891.

MY DEAR SIR,—I enclose the proof of your bulletin, which you request to be returned for correction. I hope, in my former letter I made clear to you the objection as urged by Mr. Blue and as endorsed by myself. You state that in a former bulletin an exact parallel of this computation was inserted. This, however, does not help us. If the table is liable to give an incorrect idea of the conclusions reached, it ought not to be continued.

Yours very truly,

JOHN DRYDEN,
Minister of Agriculture.

Professor THOMAS SHAW,
Agricultural College,
Guelph, Ontario.

On March 14th, Mr. Dryden wrote Professor Shaw as follows: "Mr. Blue informs me that he has not yet received the corrected proof of the bulletin *re* Swine. We would like to know when it is to be expected, so as to arrange for the printing."

On March 16th, Professor Shaw replied: "The bulletin in reference to feeding swine, I have mailed to you in a separate envelope. I hope the changes will be satisfactory to all parties."

On November 26th, 1891, Professor Shaw wrote to the Deputy-Minister in answer to his letter of the 24th inst. as follows:

"I think there must be some mistake in your calculation in reference to the number of pages required for the bulletin relating to the feeding of grade steers. I notice what you say in reference to the desirability of having these bulletins short, with a view to encouraging the press to publish them."

On May 31, 1892, Mr. James, the Deputy-Minister, wrote Professor Shaw as follows :

TORONTO, May 31st, 1892.

DEAR PROFESSOR SHAW,—Your two bulletins have been received and I have consulted Mr. Dryden as to their publication. I expect that we shall soon handle the one on "Rape Culture." As to the other, "Fattening Lambs," the Minister thinks that the financial statement, if given, should take in all the items of cost, especially that referring to cost of the rape fed. See 1891 Report, p. 104, as to this. You also have made a mistake, giving $906.65 instead of $960.65 as the cost of the other food. On the accompanying sheet I give your statement, and below it another, taking in also cost of rape and rental of land. Please look it over and give me your opinion as to it. The publication of the bulletin in its present form would, in the opinion of the Minister, arouse discussion and criticism owing to the omission of the figures referred to.

Sincerely yours,
C. C. JAMES.

Table III., According to Bulletin.

Cost of lambs when bought	$2,097 34
" shearing 120 lambs	5 40
" food (mistake, should be $960.65)	906 65
" attendance	125 00
	$3,134 39
Value of lambs when sold	$3,642 16
" wool	56 68
" manure	577 12
	$4,275 96
Gain	$1,141 57
Gain per lamb	1 71

Corrected and amended Statement.

Cost of lambs	$2,097 34		
" shearing	5 40		
" food, except rape and pasture	960 65	Bulletin p. 16.	
" rape, 40 acres, @ $11.77	470 80	See 1891 Report, p. 104.	
" rape, 6 acres, @ 5.80	34 80		
" pasture	.....	Bulletin, p. 11.	
Rental of 46 acres and cost of winter shelter	75 00		
	$3,643 99		$3,643 99
Proceeds of sale	$3,642 16		
Sale of wool	56 68		
	$3,698 84		$3,698 84

Final Statement.

Dr.		Cr.	
Total cost	$3,643 99	Receipts cash	$3,698 84
Interest on investment $3,500 for 6 months @ 6%	105 00	Estimated value of manure	577 12

On June 13, Professor Shaw asked for a copy of the bulletin to be returned for corrections; and on the twenty-first of the month, having corrected same, he returned it to Mr. James.

On June 22nd, Mr. James wrote as follows :

TORONTO, June 22, 1892.

Professor THOMAS SHAW,
Guelph, Ont.

DEAR PROFESSOR SHAW,—I am instructed by Mr. Dryden to call your attention to the following points in connection with the bulletin on "Fattening Lambs," just returned.

1st. In your bulletin you allow only $350 as the cost of the rape, whereas in your report, 1891, p. 104, you give the cost of production at $11.77 per acre. Omitting the six acres of catch crop, this would make the cost of the rape (40 x 11.77) $470.80.

2nd. The cash received for sale of 99 lambs is placed at 7 cents per lb. =$917.21, whereas the actual amount was $913.20 (by draft from Liverpool) less the charge to ship.

The cost of shipping 100 last year was $169.19+$15.87 (Gould's expenses). This would leave ($913.20—$169.19) $744, as net returns. The entire account would stand thus approximately :

Costs.		Receipts.	
First cost	$2,097 34	Sales	$3,468 95
Food	1,431 45	Wool	56 60
Shearing	5 40		$3,525 55
Attendance	125 00		
	$3,659 19	Manure	577 12

Would not the publication of the figures as given in the bulletin bring you into conflict with your own report (p. 104. 1891) and also with the statement of actual receipts of English shipment which you will subsequently publish ? I am instructed to hold the bulletin awaiting your opinion on these two points.

Yours faithfully,

C. C. JAMES.

On June 29th, Professor Shaw wrote as follows :

GUELPH, June 29th, 1892.

DEAR PROFESSOR JAMES,—Your letter of the 22nd inst. received, which referred to the bulletin on "Fattening Lambs," returned to you on the 21st inst. Notwithstanding the changes that we have made therein to meet the view of the Minister of Agriculture, I learn from your letter that he desires further changes, which so far as I can see cannot be made without distorting the plain facts of the case and introducing contingent elements into the bulletin which we could not defend in case of attack.

You take exception to the figures which we use in reference to the cost of growing the rape. I desire to say in reference to this that the cost of growing the rape, as stated in the returned bulletin, is based on the estimate given in the report for 1891, page 104, to which you refer. The way in which we obtained the figures which are used is explained in the returned bulletin with at least a fair measure of clearness; hence I fail to understand why we should be asked to change the figures. We applied manure to only 20 acres of the land sown to rape; and on the soil thus manured, we applied only one-third of the amount used in the estimate given in the report referred to; hence the cost of growing the rape per acre was reduced from $11.77, as given in the estimate, to $8.46, as stated in the bulletin. We also explained how we obtained the figures relating to the catch crop; and I think these figures are equitable. We cannot modify them to meet the views expressed in your letter, as by doing so we would charge a full application of manure against a crop which had received only a very limited amount, and which I know you will agree with me in saying would not be right. It would also render us liable to the charge of ignorance and incompetency when the bulletin appeared.

As to the second reference of your letter, I may say that if we used the figures you mention as the cost of transportation on last year of the lambs sent to England to represent the cost of the same this year, we would use figures that would not be quite correct, and so would lay ourselves open to hostile criticism. If we only give a few items relating to this shipment, the conclusions drawn would be very likely to mislead; whereas, if we wait for all the items, it would not appear in time to be of service to the farmers in making purchases for fattening next autumn. It would also be unduly complicated, and furthermore it would be impossible to compress it in six pages, to which we are limited by the department. Mr. Zavitz and I are both strongly of the opinion that a separate bulletin should be brought out relating to the experiment with the shorn and unshorn lambs, and also in the shipment to England, as there are many facts in connection with these experiments which we conceive it would be higly advantageous to give to the farmers, and which could not be easily compressed into a smaller space than is allowed to one bulletin.

We prepared this bulletin as soon as we could get the information, and forwarded it to the department for publication on May in the hope that it would reach the farmers early, but owing to the correpondence which has arisen in regard to it, it is not yet printed. We regret the delay for reasons already given, and trust that in view of the explanations contained in this letter, the Minister may see fit to have it published at once in the form in which it was returned to you.

Truly yours,

THOMAS SHAW.

Professor C. C. JAMES,
Deputy-Minister of Agriculture,
Toronto, Ontario.

The evidence taken before the Commissioners proved that the cost of the lambs, as stated in the bulletin by Professor Shaw, was less than the actual amount paid out. This discrepancy was unknown to the Minister and the incorrect amount was allowed to be published.

And Mr. James replied on June 30th, as follows:

TORONTO, June 30th, 1892.

Re Lambs.

DEAR PROF. SHAW,—Yours of June 29th received to-day.

If you examine the following dates you will find that we are not responsible for much delay:

May 26th, MS. of bulletin received (Approx).

May 31st, letter to Prof. Shaw as to omission of cost of rape.

June 21st, bulletin returned from Guelph corrected.

June 22nd, letter to Prof. Shaw as to price of English shipment.

June 29th, Prof. Shaw's reply.

CHARGE AGAINST LAMBS AS TO RAPE.

In Bulletin LX. and on page 104, 1891 Report, you charge rape $3.97 for manure; this is one-fifth of the application of the manure. Then the other four-fifths must be charged against subsequent crops. In the case of the rape of the bulletin, you say in your letter that you manured only 20 acres, and that at rate of one-third usual amount. Now, should you charge merely this application or a fair share of the cost of manure applied during the rotation to which the rape belongs? Would a farmer be satisfied with charging merely the small application of that year, irrespective of the fact that the rape profits by previous application, especially when you credit the transaction with $577.12 for manure produced? The question is, in my mind, a little indefinite in the bulletin, as you merely state that you charge $5.46, instead of $11.77, "owing to the difference in the amount of manure applied."

I may perhaps be thought to be too critical in the above, but that is how the matter strikes me. It of course makes very little difference to me personally, but it may strike others in the same way. The question for a farmer to settle is whether, taking all things into consideration that should be taken, much or little is made upon the entire transaction.

AS TO RECEIPTS OF ENGLISH SHIPMENT.

On this point I am certain that Mr. Dryden will require the actual net receipts to be stated. On June 17th Mr. Dryden sent the cheque to the College for the sale amounting to $913.20. The Bursar has sent us the statement of net receipts as follows: $803.89 ($913.20, less $111.94 or thereabouts). These figures you must have, although you state "If we only give a few items relating to this shipment the conclusions drawn would be very likely to mislead; whereas if we wait for all the items, etc" I fail to see how it could complicate or increase the size to replace the figures given by those you now have.

The statement, taking all your other figures, would be:

Cost	$2,097 34	Sales	$3,528 84
Shearing	5 40	Wool	56 60
Food	1,316 25	Manure	577 12
Attendance	125 00		
	$3,543 99		$4,162 56

As I stated in my last letter I am simply submitting this for your opinion and consideration. As soon as Mr. Dryden returns I shall shew him your reply and act upon his instructions.

I am,

Yours very truly,

C. C. JAMES.

On July 9th Mr. James wrote to Prof. Shaw, returning the bulletin to make additional changes, as set forth in the letter, as follows :

TORONTO, July 9th, 1892.

DEAR PROF. SHAW,—Mr. Dryden has requested me to inform you in regard to the bulletin on lambs that he thinks it advisable for you to replace the figures given on the English shipment by those actually netted. It of course could be stated that you received an offer of seven cents for them. The Minister thinks it would be very difficult to defend the figures as given, since the others are available at the same time.

I return the bulletin by this mail in order that you may make the changes.

Yours very truly,

C. C. JAMES,
Deputy Minister of Agriculture.

Prof. T. SHAW,
Ontario Agricultural College,
Guelph, Ont.

On August 10th proofs of the two bulletins were returned for the purpose of being condensed. On August 12th Prof Shaw returned the same.

On Nov. 3rd Mr. Dryden wrote as follows, with reference to bulletin LXXXIII, on "Feeding Shorn and Unshorn Lambs in Winter."

TORONTO, November 3rd, 1892.

DEAR SIR,—Some time ago you sent to this Department two bulletins for publication. Both were sent to the printer with practically no changes, and the proofs sent to you for correction. Remembering the difficulty frequently met by us in getting you to make any changes suggested by this Department, I gave instructions to have them sent to you just as they came thinking you yourself would see the inconsistencies so apparent in the bulletin on feeding of sheep. I have ordered the bulletin on "Feeding Steers" to be printed and distributed, which I believe is now being done. You have returned the bulletin on sheep unaltered, and I have instructed Mr. James to hold it for further orders. I cannot, as Minister of Agriculture, allow this bulletin to go out in its present form. It would bring, I know, exceedingly harsh and unanswerable criticism upon the Department and the farm management. It seems to me that even a cursory reading would show any farmer or farmer's son the gross inconsistency of the bulletin with itself and also with previous bulletins on fattening lambs. The inconsistencies of the different parts of the bulletin are as follows :

(1) You feed 7.689 lb. of food per day in all, of which 5 lb. were roots, and you get and claim 9.17 lb. of manure per lamb per day, even after an average daily increase of 0.285 lb. and 0.238 lb. per lamb, and after considerable of the food may have been consumed in keeping the sheep warm, etc.

(2) From $55.70 worth of food you claim to have got $65.36 worth of manure. Does this not seem to be going beyond even the most extreme limits of value when one dollar's worth of saleable food such as oats, peas, bran and hay can be fed to fattening animals, and $1.17 worth of manure produced? In this connection you state in the bulletin that "The estimate was further based on the quantities of food consumed daily by the two lots respectively."

(3) You state that the commercial value of the manure made is 1¼ cents; your results are nearly double of that.

I have asked Mr. James to give me a statement of the results in your previous experiments and a glance at the following table shows the inconsistencies:

Bulletin.	Value of		Ratio.
	Food.	Manure.	
No 67, 1891—Shorn *vs.* Unshorn (20)	$ 62 90	$ 16 96	27 per cent.
" 69, 1891—For Britain (100)	339 62	122 85	36 "
" 77, 1892—Fattening (666)	1316 25	577 12	44 "
" 78, 1892—For Britain (100)	380 83	237 74	62 "
——— Shorn *vs.* Unshorn (20)	55 70	65 36	117 "

You are probably not aware of the extent of the criticism indulged in by leading farmers in regard to some of the previous bulletins cited above. In view of that I must insist on statements being made that can be defended and that will not grossly conflict with previous statements.

Yours very truly,

JOHN DRYDEN,
Minister of Agriculture.

Professor SHAW,
Agricultural College,
Guelph, Ont.

To the foregoing letter, Prof. Shaw replied, on November 9th, as follows:

GUELPH, November 9th, 1892.

DEAR SIR,—I beg to acknowledge the receipt of your letter of the 3rd inst., which takes exceptions to some conclusions in a bulletin, which is now in type, from our Department, on the subject of feeding shorn and unshorn lambs in winter.

You take exception (1) to our statements as to the amount of manure made from the quantity of food fed, and (2) to the aggregate value put upon this manure in relation to the food used. In answer to the first, I desire to say that from 7.698 lbs. of food per day, I do not consider the computation extravagant which would put the amount of the manure made at 9.17 lb. per day, when the water and bedding are added. And here I beg to remind you that this computation is based upon results actually obtained in a previous experiment to which we refer in the bulletin.

As to the second objection, you are certainly correct We find that we have made a clerical mistake in figuring, and I am free to acknowledge it is a bad one. Instead of obtaining $65.36 worth of manure from $55.70 worth of food fed, but $33.07 worth of manure was obtained from this amount of food.

This would make the ratio of the value of the manure to the food only 59 per cent, instead of 117 per cent. as given in your statement. I feel grateful to you for calling attention to this mistake before it became public property. This, however, is the only mistake or inconsistency in the bulletin as I see it. The difference in the per cent. of ratio in the value of the manure in relation to the value of the food arises from two sources, viz., the difference in the available data from which we might calculate and the difference in food values. In the first two instances which you cite, we had to work from data furnished by a bulletin brought out by Prof. Roberts, as we knew of no other source where information of such a character could be obtained; whereas in the last two we used the data, the results of actual experiment under our immediate supervision. And here you will allow me to say that you have apparently failed to observe that our experiment and that conducted by Prof. Roberts are in marked agreement as to the relation which the percentages of value in the manure bears to the cost of the food. You probably did not notice that in estimating the value of the manure in the bulletins where Prof. Roberts' work was taken as a basis, we used but half the value put upon the manure by him, lest the statement should appear too large. By taking the data which he gives us, we find that the results of his experiment as indicated above almost exactly coincide with those from our own. Using the data as Prof. Roberts gives it, the relation of the value of the manure to the food is 63 per cent., while the two experiments based upon the actual results which we obtained by weighing the food and manure and also by having it analyzed make the same relation to be 60.5 per cent. We can never expect this relation to be precisely the same in any two experiments when the prices of food differ.

We consider the value put upon manure upon the basis of the cost of commercial fertilizers as being too high; hence, in the bulletin we ask the reader to put that value upon it which may seem best to him. We have furnished the data to enable him to do so in the facts given in the bulletin.

Your obedient servant,

THOMAS SHAW.

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

As to Assistance in His Office.

Prof. Shaw stated that his office is in his house, and that the assistance he required was largely by way of research for information necessary to answer letters, general office work, looking after the registration of cattle, taking care of bulletins coming from other institutions, and to make out examination papers.

Besides having the assistance of students in his office, it appears that Mr. Putnam, the Secretary for the President wrote out the correspondence dictated to him by Prof. Shaw; and kept this in a letter book. Prof. Shaw states that Mr. Putnam took from one-half to one-third of his letters, and that he wrote the remainder himself, but that these were not copied. That Mr. Putnam, on several occasions mentioned by Prof. Shaw, had not attended for this purpose. Mr. Putnam explained the reasons for his non-attendance, which were quite satisfactory.

It appears that, in addition to the letters Mr. Putnam copied for him, Mr. Zavitz also attended to and wrote all the letters respecting seed grain.

Mr. Putnam put in a statement of the number of letters written by him for Prof. Shaw, in each month, from June, 1892 to May, 1893, inclusive, shewing 931 letters and 197 post cards in all. In February, 1893, there were 192 letters written; in March 260 letters and 118 post cards; in April 136 letters and 51 post cards.

In these months Mr. Zavitz was absent for some weeks and Mr. Putnam did all the correspondence, the greater number of these letters being correspondence about seed grain. During that time Dr. Mills attended to nearly all his own correspondence, in order to permit Mr. Putnam to write Prof. Shaw's letters.

Mr. Putnam, in his examination, stated that Prof. Shaw told him that he was foolish for taking this correspondence.

His diaries, for the years 1891, 1892 and 1893, which were produced, show that he wrote on an average an article for some newspaper, every working day. In his evidence he said, "As nearly as I can tell, about half my time before breakfast was occupied in writing for the papers, and in composing books, since 1890."

He also stated in the evidence that, on an average, he preached every third Sunday, and taught Bible Class on Sunday afternoons and Thursday evenings.

"I was employed by the Journal at $600 per annum, and was also paid for writing articles for the *Ohio Live Stock Journal*, *The Live Stock Reporter*, *The Breeder's Gazette*, *The National Stockman*, and other American papers. Including my salary for the *Live Stock Journal*, I received, on an average, for journalistic work, about $900 a year. I have been engaged at this work since my appointment as Professor of Agriculture to the present time. I never informed the President, the Minister of Agriculture or any member of the Government about my being paid for such work."

Q. You see that, notwithstanding you are overworked, notwithstanding Putnam's and Zavitz's assistance, you have admitted that you have as much work as an ordinary editor and almost half as much as an ordinary preacher over and above your work as professor.

A. I think not.

Q. Do you not think that a man who works as hard as you do uses up some of the energy he ought to give to his legitimate work?

A. This is not work to me.

Q. It is work to every one.

A. I wish all my work were as easy.

Q. But does this not all tell on your energy. See how many times you complain in your diary of hard work.

On September 30th, 1891, he wrote to the Minister as follows:

GUELPH, September 30th, 1891.

DEAR SIR,—I now venture to call your attention to a matter which has given me some thought for more than a year past. I hesitate to speak of it, as it is in a sense a personal matter, and if my request is granted will involve some additional outlay on the part of the Government. I refer to additional assistance in my office. Mr. Putnam, who now does office work for the President, is at my office for a portion of the day, and his assistance has materially aided my

work, but as the service which he renders only extends to the taking of letters which are dictated, it does not enable me to overtake my work, which is continually increasing. Many of the letters which I receive relate to the practical side of agriculture in all its phases, and, consequently, often necessitate more or less research before they can be answered. This research could as well be made by a secretary in the office, under my direction; or, at least, the references for it could be gathered in this way. I am also desirous of giving my lectures to the students in the form of notes, the first copy of which could be struck off by the typewriter, and the succeeding ones from the Cyclostyle. This would enable them to preserve the notes in exact form. In the class room I would lecture from the notes.

This mode of lecturing is, in my opinion, the most efficient that can be adopted with the students who attend here.

The experimental work of the station is also assuming very large dimensions. We are carrying on in my department at least five times as much experimental work as when I came here, and I think I am safe in saying that this work is all useful and important.

With the increase of this work my duties increase. Indeed to so great an extent has this been the case that although I give to the work of this station from early morning until 10 o'clock every working day, I am not able to overtake my office work properly, nor indeed have I been able for some time past to give the outside work of the farm the attention which it should receive at my hands.

What I desire, therefore, to ask of you is the assistance of a secretary whose whole time would be given to work in my office. Acceding to this request would lighten the strain upon me which is now very severe; it would enable me to do justice to my correspondence; to give my lectures in a more efficient manner, and to give proper attention to the outside work of the farm and the experiments generally, which in turn should bring increased prestige to the whole institution.

There would be abundance of work in the office to occupy the whole time of a secretary.

During a large portion of the year my daughter has spent much of her time in the office, otherwise I could not have coped with my work at all. For this additional work nothing has been asked from the Government.

May I venture to suggest that she be given the position of secretary as she is now familiar with the work and will soon be proficient in shorthand and typewriting. She would also be here to answer the telephone which is very exacting in its demands until a late hour. You may have strong objections to this suggestion, but nevertheless I hope it may receive your favorable consideration. The necessity for some relief is urgent, and with her assistance we could in the meantime cope with the work.

Your obedient servant,

THOS. SHAW.

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

And on October 29th, Mr. Dryden wrote the following letter:

TORONTO, October 29, 1891.

MY DEAR SIR,—I am sorry that owing to my illness and the pressure of other matters demanding immediate attention since my recovery, I have been unable to give an earlier reply to your letter making application for increased assistance in your office.

You will remember that I acknowledged receipt of your application and stated that I should desire some information in reference to your work before coming to any decision. I am perfectly well aware, and have been for some time, that you are undertaking to do too much work. You may remember that I have often spoken of this before, and have told you that it was injurious to your health for one man to endeavor to do as much as you seem willing to undertake. In my present position, however, I am bound to consider what this work consists of. If I were to recommend the Government to give you increased assistance, I would be obliged to give the reasons therefor; I would be obliged to show that your duties had increased, and before I could do that I should require to have more information than I have at present.

I have carefully considered your position; I know something about the work which is entailed upon a man who overlooks and superintends a large farm like the one in Guelph; I think I can understand somewhat of the duties appertaining to your position as a lecturer. In addition, there will be more or less correspondence growing out of your position. This correspondence you manage by dictation to Mr. Putnam. These things constitute your legitimate and proper work at the College. Whether your attention to these duties is sufficient to occupy more than your whole time is really the point which you ask me to decide.

It seems to be known to many of our agriculturists that you are the principal writer for *The Canadian Live Stock Journal*. This fact has often been stated to me, but up to the present time I paid no attention to it. I believe, however, that such is the case, and I understand that you get a very considerable sum for so doing. I shall be glad to have you state frankly whether this is a fact or not.

Then I am also aware that you are engaged in writing lengthy articles, which doubtless require considerable research and preparation, for some of the American journals, and that you occasionally write for some of the British journals as well. For these I presume you also receive ample remuneration.

Application was lately made by the authorities of the *Live Stock Journal* for my consent to your answering questions in that journal. I did not accede to this request because I did not feel that I was justified in consenting to heap more burdens upon you than you already possessed.

Then, I understand that you occupy the pulpit once or twice every Sunday. I believe you also teach a bible class, and further that you have a special training class for all the teachers in Guelph. I have no objections to work of this nature; indeed to a limited extent it is to be commended; but if it consumes so much time as to interfere with your regular work, then in justice to yourself and the College you ought to leave it to others.

I should be pleased, therefore, if you would candidly state whether, in your opinion, if this outside work were omitted, you could keep pace with your work and do it well.

Yours very truly,

JOHN DRYDEN.

Prof. THOMAS SHAW,
Agricultural College,
Guelph Ont.

The above letter was answered by Prof. Shaw on Nov. 25, as follows:

GUELPH, 25th November, 1891.

DEAR SIR,—I have been unusually busy and therefore have been unable sooner to answer your letter of 29th ult. As the said letter related to a personal matter in which I was more interested than any one else, I felt that haste was less necessary than if some public interest were involved.

I notice what you say in reference to the writing which I do for the press, and which, from the way in which you refer to it, would seem to imply that the belief rests upon your mind that this work interferes with duties here and is an unnecessary drain upon my time. In reference to this I may simply say the only time I take for work of this nature is before 7 o'clock in the morning, and not much more than one-half of these mornings is thus occupied, the other portion of them being devoted to preparing bulletins, reports and lectures.

The remaining portion of my time is all given in one way or another to my duties here, that is to say, I give to these duties from 7 in the morning until 10 at night the year round, time for meals and Sundays excepted, and I think you will agree with me when I add that these long hours are energetically employed. In reference to Sabbath work, I am in the pulpit on an average once in three Sundays, and teach a bible class on Sunday every afternoon. The preparation for this work is confined to the Sabbath itself. On Thursday evening I have a teachers' bible class, which occupies in all two hours of my time each week.

In view, therefore, of the long hours given to my duties here, and of the further fact that notwithstanding I cannot keep up properly with my work, I earnestly hope that you may see fit to accede to my request as made in my letter to you of September 30th. The reasons for the said request are stated therein pretty fully. I will only add here that I think results attained in my department should be an additional reason why my request should be granted. You will doubtless know what these results are, so that I need not repeat them here.

Your obedient servant,

THOS. SHAW.

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

Again, on January 16th, Prof. Shaw wrote the Minister the following letter:

RIDGEWAY, 16th January, 1892.

DEAR SIR,—In answer to yours of 4th inst., which I now have, and which bears upon my application for assistance in my office work, I beg to say that your letter surprises me beyond measure.

I cannot conceive that any man feeling the responsibility of his position as head of a Department would thus, without any provocation, publicly place me in the position which your letter informs me has been decided upon. No greater insult could be offered to me in my position than to publicly proclaim that I am not in your estimation fitted to superintend the experimental field work of this institution, which, after all, is the most important department of experimental work in connection with this station.

This you certainly do when you take from me this department which has been increased fivefold under my supervision during the past three years. I yield to no one in my admiration for the worth of Mr. Zavitz, but I positively refuse to be humiliated in the eyes of the public by the change suggested.

I may say further that the proposed change does not relieve me of one iota of the work of which I complained. I have found no serious difficulty in discharging all my duties relating to outside work, except so far as these were hindered by an accumulation of office work, but I have felt and said that the mere mechanical part of the office work was beyond my powers.

I cannot disguise from myself that it appears as if an attempt was being made by thus humiliating me to force my resignation. If the head of the Department desires me to sever my connection with the institution there is an easier method whereby this can be accomplished than by that which would rob me of the prestige and influence which should attach to my position. In all my work here I have had the single object in view of making the institution worthy of the Province of Ontario, and a credit to the Government of which I have always been an ardent supporter.

If I have failed in either of these particulars, it has not been from the want of an earnest desire to render substantial service both to the Province and the Government which placed me in my present position.

Your obedient servant,

THOS. SHAW

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

As to the Pedigrees of Stock.

Q. Did you speak to any of the students about the Oxford Down sheep that could not be registered?

A. Yes, in answer to questions.

Q. Also to ex-students?

A. I do not remember. I will not swear I did not. I may have spoken to others in this way, that parties wanted to purchase them.

Q. But in a manner to hold up the Minister as a person not qualified?

A. I do not remember having done so.

Q. Will you swear you did not?

A. I will not swear.

The following letter was written by Prof. Shaw to the Minister on the 13th April, 1892:

GUELPH, April 13th, 1893.

DEAR SIR,—I have just received a letter from Mr. J. B. Ellis, West Baishan Walsingham, England, who is the person from whom the Oxford Down sheep

were purchased. He mentioned that his flock had never been recorded in any of the flock books. According to the rules of the American Oxford Down Association, this will exclude the sheep from registry.

I have felt it my duty to let you know this.

Your obedient servant,

THOS. SHAW.

Hon. JNO. DRYDEN,
Minister of Agriculture,
Toronto, Ont.

As to Purchase of Steers.

Professor SHAW.—Another instance of lack of harmony with the Minister—that he could not get the money in one instance to purchase steers for experimental purposes—the instance being last year. Prof. Shaw stated that either in August or September, 1892, he asked Dr. Mills for the money, or else called his attention to it by letter. The only letter that he appears to have written to the Minister on the subject was dated October 19th, 1892, which is as follows:

GUELPH, Oct. 19th, 1892.

DEAR SIR,—It was intimated to me by the President some time ago that you did not wish us to purchase steers for fattening until we had communicated further in reference to the matter. I remember also what you said in reference thereto in the same line when I last saw you in Toronto. One objection to such a course which you then offered was that we would be crowded for room.

Now that it is determined to hold a sale in December, that objection will be removed. I would very much like, therefore, to have your permission and consent at an early day, authorizing my department to purchase six or eight head of steers for experimental feeding this winter. We only really require six head, but I would recommend purchasing eight head and selling two of them again at the sale. I think it better to purchase eight head for the reason that in starting experiments we sometimes find that we have reason to throw some of the animals aside, hence it is not safe to start an experiment with a considerable number of animals without having somewhat more material than will finally be used. Our principal object in this experiment is to ascertain the relative cost of different rations with a view to determine which is the cheapest in beef production.

I have talked the matter over with Mr. Zavitz, and he also is decidedly of the opinion that this experiment should be undertaken, if possible, and as soon as possible. The estimate made for this purpose will be quite sufficient. An early reply in reference thereto will confer a favor.

Will answer your letters of 14th inst. to-morrow.

Your obedient servant,

THOS. SHAW.

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

On October 26th the Minister wrote as follows: "I have received a letter from Prof. Shaw making a further request for money with which to purchase eight steers for experimental purposes. I have no objection to the purchase of these steers provided the following conditions can be complied with: First, that the stable is not overcrowded; second, that there is sufficient feed on hand for the animals without scouring the country constantly for straw and hay as has been done for some years past; third, that the appropriation for this purpose be not overdrawn." A requisition seems to have been issued in August and returned by Dr. Mills on September 18th.

In his examination the following took place:

Q. I see that $300 was allowed for these steers. You were asking for eight, and Story wanted ten, and seemed to find fault with the Minister because he did not get that number, and stated that as a result a lot of feed was not used up. Your estimate was for six steers—$300, and that amount was appropriated for that express purpose?

A. Yes.

Q. Then if you asked for eight you would overrun the appropriation unless you got them for $300?

A. Yes.

Q. The Minister stated that if your appropriation allowed you to purchase more than six—purchase them?

A. I know the letter states that.

Q. The Minister stated that so long as the appropriation was not overdrawn—purchase all the steers you wanted?

A. Yes, but there was something in the background.

Q. I see a long entry in your book about the matter, November 5th, 1892: "It was intimated to me by the President to-day that we might go on and purchase steers. This leave which first came from the Minister to the President was not obtained and could not be obtained sooner, although the estimate passed the House in February and the amount required had been put in the monthly requisition sent to the President on August 15th. The Minister held back his assent until he knew, as he stated himself, that the estimates had not been overdrawn."

Q. Did he hold over the requisition?

A. I think he did.

Q. You say he gave you the money at once?

A. But there was some communication before that time.

Q. You say not in your diary. On November 5th, the President gave you the Minister's consent?

A. There must have been a reason or I would not have done it. I know there was some communication that hindered the purchase. I would not have made that statement to Story if I had not received instructions to that effect.

Q. In what instance have you ever been refused money?
A. It was kept back in the case of the steers for a time.

Q. Have you given me all the evidence you can give on that point?
A. I have given you all I can. I think I could get further evidence.

As to Various Expenditures.

In reference to the large expenditure for feed. On May 26th, 1891, Prof. Shaw wrote to Mr. Dryden, in which he states as follows:

"Is it your desire that the experimental steers (yearlings) be shown at the Toronto Exhibition? If so, it will be necessary for Mr. Cuppage to push them on a little faster perhaps than he would otherwise do.

"I suppose that we are at liberty to look up steers for feeding another winter as soon as we can get time to do so. In reference to the purchase of lambs, I wish to make the following proposal, and I sincerely hope you will not say no to it. I would like to purchase one carload of lambs in Prince Edward Island, bring them to this farm and fatten them on rape, and sell them for the Christmas market wherever we can. I think we could make it pay well."

On June 3rd, the Minister in reply wrote as follows:

"In reference to the steers for feeding, I presume what you refer to is to get a number of steers in order to carry on similar work to what you have conducted for the past two years. I presume there can be no objection to this. My opinion, however, is that you are likely to get too much stock for your supply of feed and that we shall be in a similar position to that in which we are now placed."

On June 5th, Prof. Shaw replied as follows:

"I may mention in reply to your expressed fear that we will gather too much stock upon the place for our supply of feed, and I am trying to keep a close eye on that and will enter the winter less heavily stocked than we entered a year ago."

On November 19th, Mr. Dryden wrote as follows:

"In our conversation of yesterday I omitted to suggest that should you require to buy hay, as I suppose you will, it will be better to purchase it early in the season rather than later on. Owing to the present state of the weather, I presume that the five or six hundred lambs you have on hand will have to be fed for a considerable time on hay and oats. If I am right in reference to this I think that it would be better to buy hay now rather than to use our own entirely up and be obliged to buy for our own stock later on in the season.

The following evidence was given:

On 26th September, 1889, Hon. Mr. Drury wrote a letter complaining of the expenditure on account of labor. In a letter of September 30 Prof. Shaw stated: "I can assure you that it is my sincere desire to keep the expenditure in my department as low as is compatible with rendering it successful, and I am trying to exercise vigilance in this respect."

On 22nd October, 1889, the Minister wrote as follows: "Since conversing with you yesterday I have come to the conclusion that we must be extremely

careful with our expenditure for the remainder of the year, for, as you will observe, the appropriation for the farm is running very low. I do not think it is desirable that more help should be employed."

In 1889 there was correspondence about the over-expenditure in the farm department.

From the annual reports of the College and Experimental Farm the following is taken :

In the year 1889 the estimates were over-expended in the farm proper by $373.64, and in experimental by $518.18—total, $891.92.

In 1890, permanent improvements were over-expended by $173.87, salaries and wages by $285.52, live stock by $3,005.43, maintenance by $991.14, sundries by $816.39—total over-expenditure for farm proper, $5,121.10, and for experimental, $174.22—total, including permanent improvements, $5,464.19. During that year there was $3,027.34 paid by the College for student labor.

In 1891, permanent improvements were over-expended by $772.40, salaries and wages by $1,249.53, live stock by $6,485.48, being about $4,000 over expenditure for imported stock and over $2,400 for the other stock; maintenance of stock $1,660.88, sundries $326.22, experimental $138.57—$10,633.08.

In 1892, salaries and wages were over-expended by $400.65, live stock by $1,492.12, but in other items there was sufficient saved to make the total over-expenditure for the farm proper, experimental farm and permanent improvements only $85.62.

On October 22, 1889, Mr. Drury wrote as follows :

TORONTO, Oct. 22nd, 1889

DEAR SIR,—Since conversing with you yesterday, I have come to the conclusion that we must be extremely careful with our expenditure for the remainder of the year, for, as you will observe, the appropriation for the farm is running very low. I do not think it desirable that more help should be employed for the winter months than we discussed yesterday—that is, Curruthers to take charge of team, cattleman at $400 per year, and Cuppage as assistant cattleman at $400, and Parker, or some other man if he is not available, for two months with team.

You will please bear in mind that we are desirous of giving students as much practical work as we can consistent with our financial position, and I should think there would be no difficulty in finding students who are capable of taking charge of a team if occasion should require.

The quantity of manure purchased this winter must be reduced. It is not only that the price seems high, but it must be remembered that if a team brings only two or three loads per day, that it raises the price to a point at which it is very doubtful whether we can get value. I was very much surprised to learn that two or at most three loads were supposed to be a very good day's work for a teamster.

As soon as the cattle are all in the stables, I am anxious that practical instruction in the feeding of stock should be given to the students.

CHARLES DRURY,

Minister of Agriculture.

Again on Nov. 20, 1889, Mr Drury wrote as follows :

TORONTO, Nov. 20th, 1889.

DEAR SIR,—Replying to your favor of the 19th instant, in which you state that you desire to engage Mr. Linfield for work during the winter, I beg to submit to you comparative statements of expenditure for student labor on the farm account for the first nine months of 1888 and 1889 respectively :

1888.—Paid for student labor to September 30th, $1,644.72.
Average amount paid per hour, 8½ cents.
Work during January vacation, $4.08.
Student labor for July, August and September, $438.89.

1889.—Paid for student labor to September 30th, $2,809.71.
Average paid per hour, 9 cents.
Work during January vacation (cash), $195.59.
Special, $86.62.
July, August and September, $796.05.

This statement shows an expenditure of $2,087.69 for student labor for the period mentioned in 1888, and $3,888.97 for student labor for the same period in 1889, or an excess of $1,801.28 under this head for the present year. But I desire also to call your attention to the fact that in addition there has been an expenditure for salaries and wages of about $500 for the first nine months of this year in connection with the farm proper over and above the expenditure for the same purpose in 1888.

It was in view of this large expenditure that I desired to reduce the winter outlay to the lowest possible point. I think you will agree with me that such work as hauling stones cannot be successfully carried on in stormy and disagreeable weather. I think it important also that you should bear in mind that you are publicly committed to the statement that the farm proper should be made to pay expenses. However, you can mention the matter to me again upon the first occasion that I visit Guelph, which will probably be at an early day.

Yours very truly,

CHARLES DRURY,
Minister of Agriculture.

Prof. Shaw, in explanation of the increase of cost of labor, referred to in the foregoing letter, states that there were more students remaining for the summer of 1889 than in 1888 ; that they worked a great deal better and were deserving of better pay ; and that the same explanation applied to the increased expenditure for the succeeding years.

It was explained that Mr. Story returned the student labor, as directed by Prof. Shaw, according to the department in which they worked, and it is such statement that is printed.

In his evidence Prof. Shaw referred to the above, and stated that in the following year he made a profit out of the farm—that he had full control that year, and that he had not any other year. The evidence produced showed that he had not in any year made a profit, but always exceeded the estimate in his expenditure.

F. B. LINFIELD stated: "I kept the farm accounts for Prof. Shaw in 1890. An account was kept showing the proportion of the salaries chargeable—there was student labor, thirty or forty in an afternoon. When the day's work was over they were marked so many hours at so much an hour. Each one was marked under what head it should be charged. Prof. Shaw, Mr. Story and myself settled it between us. I received $50 for keeping the accounts. Referring to the stock, we kept a large number of breeds—I think seven or eight—and the same with the sheep and swine. There is no person can keep this many sires and make money out of them. They were not patronized, and were almost a direct loss. The farm was charged with this. You have got to be arbitrary in the values you put upon them in stock-taking. In the same manner the stock gets old. Some of the cost was, therefore, charged to the farm and some for educational purposes. The idea was to keep the farm accounts proper separate from the educational, experimental and other branches that did not properly belong to it."

Mr. JOHN I. HOBSON stated: "As chairman of the Board, I think the system of farming is not carried on along a line that is desirable; that the amount of money expended for feed for cattle is altogether too great. I think the cost of labor is altogether too great. I think the farm should produce the larger part of the feed required—making exception of such as is required for experimental work in the way of artificial feed. I think it is a mistake to buy such quantities of hay and straw. It should be carried on along the lines of the best managed private farms. The labor question is altogether out of proportion. I am told that the farm came out a little ahead in 1890. I have often regretted that I had anything to do with it that year, for this reason: at that time I thought I might have made a mistake in not examining more carefully the amounts credited to the different departments of the farm to see whether they were properly charged. I am not saying that anyone attempted to mislead me, but I have good reason to believe that too much was credited to the different departments. I was the auditor for that year, and made the report that there was a balance of $1,709 to the farm. I believe I made a mistake in taking that position at all, because I had not an opportunity of acquiring the necessary information. We thought the feeding of five or six hundred lambs was a mistake. We believed that carrying on the feeding of lambs was all right, but when it came down to a matter of speculation—buying hundreds of them—we thought they were exceeding the proper lines. We thought they should have given more time to growing coarser grains, and that the element of speculation was entering into it too much."

Prof. Shaw gave the following evidence:

Q. Did you understand how Linfield kept the accounts—he received $50 extra for that?

A. In a certain way I did—I told him where we would like the items charged.

Q. Did anyone understand?

A. I do not know. I said we wanted the accounts kept separate for the farm this year. I questioned him as to whether he had been taught book-keeping in the College. He said, "yes." I said, "I am not a book-keeper myself, and will depend upon you to keep this thing straight, and you can advise with Mr. Hunt, if you think proper, as to the accounts to be opened and the mode of keeping. In regard to the way certain things are to be charged always consult me."

Q. Did you ever go over the accounts with him ?
A. No.

Q. You did not know whether he charged the items up properly to profit and loss ?
A. I cannot say positively.

Q. Do you say Mr. Hobson went over these accounts with him ?
A. I think he did—at least he looked over the statements submitted to him.

Q But he never went over the vouchers ?
A. Not that I know of.

Q. Did he not go into Linfield's accounts ?
A. Not that I am aware of.

Q. You took no pains to see that the accounts were correctly kept ?
A. None other than what I have stated.

Q. And you charged yourself with all the money received from the Government ?
A. No.

Q. And you charged the different departments with the labor spent on them and credited the farm with the labor ?
A I am not clear on that point.

Q. After charging yourself with $1,995 for student labor, you credited yourself with labor of students, etc., $497 for permanent improvements, $419.47 for experimental department, $31.31 educational department, $343.34 temporary improvements, $117.45 dairy department and $181.82 College. Permanent improvements come under capital account and not under profit and loss. So far as I can see the account is not properly kept.
A. I think I am right in saying that even though permanent improvements be added in there is still a profit.

Q. Did you look into the accounts or know anything about them ?
A. I did not follow the details, but simply advised as to the basis of charging complicated accounts.

Q. Do you think you could understand Linfield's accounts and show that there was that profit ?
A. I do not know that I could now.

Conduct of Professor Shaw.

Mentioning his Grievances to Students, ex-Students and others.

A. Curzon: Heard Prof. Shaw state two years ago that there was no love lost between himself and the President. Heard him say that he had more work than he could manage with the practical work outside, and that he needed a secretary; he referred to his office and outside.

S. CURZON: "Heard Prof. Shaw say if he had things his own way the farm would not be in the state it was. Said he wanted a secretary. He spent a good deal of his time spudding thistles. It has been whispered around that if he were in want of a secretary he would not be out so much."

JAMES FINDLAY: "Heard Prof. Shaw speak about having too much work and not having a secretary, He said he had quite a lot to do and could not get assistance. The students were talking over the petitions sent about Mr. McCrae. Prof. Shaw was there and said that if the students were as much against him as they were against other Professors when he went to lecture his tongue would cleave to the roof of his mouth."

JOSEPH VIPOND: "Have heard there is a lack of harmony here. I have been led to believe so from conversations with the students and with Prof. Shaw. Several times when working with him he would pass a remark that would lead me to think they were not in perfect harmony. Something to this effect: 'If I had full control and did not have to go to the Minister or the President for every little thing it would not be so inconvenient for me.' That was mostly last fall. Different students were present at different times. One expression he used was: 'You have no idea how I am used here,' or things to that effect. He thought he should have the right to say and do a little here. It seemed to me that the President, the Minister of Agriculture and the Professor of Agriculture were not in harmony. He has mentioned Mr. Dryden's name several times and, I think, also the President's. He mentioned the Minister's name in this way—that the Minister wanted to run the whole show around here. The effect on my mind was that I felt the Minister was not doing his duty towards Prof. Shaw. I thought that Prof. Shaw ought to have the rule of the farm as he was here all the time, and that he should leave everything to Prof. Shaw. I remember three or four weeks ago that Prof. Shaw said that this place was going to be investigated, and investigated well. He said that to the boys as we were working on the road this spring. I think Prof. Shaw should be the head of his department. I think the Minister was putting himself before Prof. Shaw in importing stock. I think Prof. Shaw referred to getting some farm implements, some spades or shovels; he had to ask the President. It was either he or the farm foreman who made that statement, that he wished they could get farm implements whenever they liked. From the students I was led to believe that the stock were imported without consultation with Prof. Shaw, and I think that was improper."

R. HENDERSON: "Prof. Shaw said something last year about Mr. Dryden. I do not think I can tell you; I do not like to. Well; he said that Mr. Dryden was a man whom he disliked. He did not think Mr. Dryden was doing the right thing. This was out in the field."

J. A. STEAD BURNS: "In the plowing examinations in the Second Year, 1892, I was complaining that we had not enough instruction in plowing. I thought the Government ought to place more men at the disposal of the students. He, Prof. Shaw, said that the Government did not feel able to do that. He said it would be necessary, that he would do it if the money were provided, that it was not his fault."

Q. Did Prof. Shaw ever apply for a team and did not get it?
A. I do not think he ever applied for a team.

Q. Are you aware that there are more horses now than when the instructor devoted his whole time to it?

A. No. Prof. Shaw said he had been refused 50 copies of a bulletin by the Minister.

W. M. NEWMAN: "Prof. Shaw said that he would not be responsible for the cattle as they were not taken care of to suit him. He told me that. He said they were entirely too fat and were not properly taken care of. He told me the chances were he would not be here a very great deal longer; that those in authority over him were making his life unbearable. He did not mention names. The Professor knows me and did not need to. I understood by that the Minister of Agriculture and the President."

A. HIGH: "I heard Prof. Shaw say that he would not be surprised if his position were taken away from him. That was said in the field. There were a number working together. I heard him say something to this effect, that if he had received the money in the estimates that his predecessor did he would be able to carry on the work of the farm better than he was doing; he meant for fixing up around the College, making roads, etc. Understood from Prof. Shaw that labor would not be paid for above the board. I had my board paid, and did not feel like working for nothing. I asked the President to excuse me from work. He sent me to Prof. Shaw, and the Professor sent me back to the President again. I told Prof. Shaw that I did not wish to work any more and not get paid for it. He said he did not blame me for that, and he said, 'We will go over to-night and see the President.' The President then asked if I thought there were any more students who would want to be excused. I said I thought there would be. On that account, he said, it would not be possible to excuse any from work; if they excused one they would have to excuse all. When Mr. Mills refused I asked him if I had to work without getting pay for it. He said, if there was any money over and above my board it would be refunded at the end of the term. I was willing to work then, and did so. I think Prof. Shaw had misunderstood the letter he had received, and he asked Mr. Mills to announce it next morning to the class.

When the President made that statement in the class room, I went to Prof. Shaw the next night in the College. I told him that I did not mean to make a statement to the President that would lead him to make the statement he did. He made the remark that Mr. Mills would not have made the statement if he had been there.

I cannot say that Prof. Shaw stated to Dr. Mills that he had been mistaken in the matter at the time we both saw him about it, but he said something that would convey that meaning, I think. Prof. Shaw asked him to make it clear to the students next morning that this was not the case. I do not remember anything further than that."

W. M. NEWMAN: "Last Easter I took care of Prof. Shaw's horse. He went to Fergus to preach and I took him to the station. He told me that he had been told by Mr. Putnam that there would be no lectures on the Monday. He was coming back on the Monday morning. There was a lecture on the time table that morning for him. He told me not to drive down for him, that he would walk up; but I did, as I did not need to attend the lecture. I told him there were lectures that morning. About fifteen minutes after the lecture hour I went to the President and told him we had no Professor. He told me to go and tell Prof. Shaw. I told him he was not at home. Then he asked me to tell the boys to keep quiet.

for that hour. When I told the Professor he was very sorry he had not been there and provoked that he had not been informed before. I think I told the fellows Prof. Shaw understood that there would be no lectures.

There has also been some trouble in regard to student labor. There was a letter sent to the President about it. I was intending to stay here all the summer to work. One day I asked Prof. Shaw what we were going to do about work in the summer. He said he did not know how it could be managed, that there had been no information sent of it by the Minister. That was this spring. Then some of the fellows told me that if we did more work than would pay expenses it would be credited next year."

ANOTHER INSTANCE: "Prof. Shaw agreed to give the first year lectures after the day, 7 to 8 p.m., to enable us to get all the lectures. One night after the lectures had been going on for two or three weeks the President announced that he would give the first year a lecture in English at that hour; that is, he took the Professor's hour. I understood that the Professor had not been informed of that arrangement."

R. HARCOURT: "There was one thing struck me rather queer at the time I asked Prof. Shaw last fall what stock was being imported. He said he did not know. I wondered why Prof. Shaw, as head of the department, did not know, and I wondered if there was any lack of harmony."

C. M. MACFIE: "He said his duties were such that he required an assistant, and he thought he had sufficient work to warrant it: that he could put the farm in better shape if he had not so much work to do."

P. CONN (two-year student, 1892): "I remember hearing that Will Shaw was going to ride with the Captain from the city. I think he did ride up once or twice and then Edward Mills rode up instead. I did not think that looked well. I heard that Edward Mills went and spoke to Mr. Mills about it and, after that, drove Captain Clarke's horse."

Q. Did you hear that Dr. Mills directed his son to see that he drove the Captain's horse?

A. That is what I understood. I think from Mr. Story, the farm foreman.

DR. MILLS: I wish to say that it is an absolute falsehood that I had nothing to do with the matter.

Prof. SHAW: I have reason to believe it is true.

Q. You have heard what these gentlemen have said; will this help you to remember who told you about it?

A. I think it was Mr. Story. I am almost certain that Prof. Shaw did not tell me.

I have heard Prof. Shaw say that he was not satisfied with the cattleman. He said that the cattle were too fat—they were fed too much meal.

Once, when I was working in his office, he said that he had a lot of work to do and should have a secretary; he said he had too much to do: he said he had been refused by the Minister.

We know that the farm paid one year, when he had full charge of it. It never paid before nor since. I asked him the reason, and he said he had not charge of it.

J. A. S. BURNS, with reference to the investigation into the McCrae matter, said: "I asked Prof. Shaw if we had a right to a lawyer, and he said he would ask a lawyer on that subject. He afterwards said that it would depend upon the kind of investigation as to what powers he would have, but that no matter what kind of investigation was appointed, we had the right to have a counsel present, but that this power would be limited by the Committee."

Q. What lawyer did he consult?
A. I do not know.

Q. Did he suggest that you do that?
A. No; I asked him on my own behalf.

Mr. CONN: "Prof. Shaw said the farm paid the year he had charge of it, but that the Minister imports cattle now and that he does not buy them—he has not full charge. He gave me to understand that the Minister imported cattle without his knowledge, not that he made an importation without consulting him in any manner."

Q. Was there anything else for which he blamed the Minister?
A. They sold a cow at the sale two years ago, I think. That cow was shipped on the train and she picked her calf (aborted). She was sent back and the Minister ordered her to be sold to the butcher. She was sold for four cents a pound to a butcher in the city; she now has a good calf.

Q. Did Prof. Shaw find fault with that?
A. They tried to make out that she was affected with something that caused her to pick her calf, and that such a cow should never have been sold at the sale. The purchaser would not take her. Mr. Story told me about this.

Q. You say that Prof. Shaw found fault with the Minister. Did he tell you so?
A. I do not think so—Mr. Story told me.

Q. That Prof. Shaw was put out about it?
A. Yes.

PATRICK B. KENNEDY: "In my second year I noticed in lectures that there was a kind of general dislike by Prof. Shaw to the management of the place. Nothing was said directly, but always indirectly. If he mentioned the Dairy Department he talked as though it had no connection with the College. He said, 'I cannot carry on experiments successfully so long as the authorities keep the men they have around here'; this was said before the whole class during lectures. Prof. Shaw said, 'I agreed to meet the President here at ten o'clock. I have fulfilled my part of the agreement. You see he is not here. I made a fair and square engagement with him last night, and I do not mean to wait upon him. That is all. Thank you.'

Remarks from the class: 'That is straight enough for you,' etc.

During the McCrae investigation Ferguson, Macfie and Newman came to where Prof. Shaw was working on the road. They were with him about an hour each.

I heard Prof. Shaw say what I thought to be a slight on McCrae; he said he had better give the boys a little honey to make them go to his lectures. I think it was said as a joke, but I did not think it right for Prof. Shaw to make a joke about it at that time. In my judgment it was an improper one."

JAMES FINDLAY: "I have heard Prof. Shaw speak about having too much work and not having a secretary. He said he had quite a lo to do and could not get assistance. The students were talking over the petition sent about Mr. McCrae. Prof. Shaw was there, and said that if the students were as much against him as they were against other professors, when he went to lecture his tongue would cleave to the roof of his mouth." As to ploughing, he gave the same evidence as Kennedy gave. He added, "It was not very nice before all the students; some were remarking about it. Some time ago I went to Prof. Shaw and asked him about payment for our labor. I had asked Story, and he said he did not know. Prof. Shaw told me that the grant had been cut down, and he did not know how we were to be paid this summer, but to call again and he would tell me. He told me afterwards that the grant had been cut down, and that he was not going to give any third year men work, except for a few days. He said the only thing would be to let the students work till the money ran out; that they would not get any cash over and above their board, and that it would not be applied on the board for next term. He showed me a letter from the Minister one night in his house. It was about work. It was three or four weeks ago. He misrepresented the matter to me, as I suppose, because it read that students would be hired by the hour, and that the money would be paid to them. That was why I enquired about it from the President. That letter seemed to be misrepresented. I know it was to me till I read it."

FRED. CALDECOTT: "Heard Prof. Shaw say that there was a possibility of his not staying longer than the end of the term, 30th June, 1893; did not give his reasons."

ED. WILSON: "Prof. Shaw said last year that the sale about to be held would not be a credit to the place."

Mr. DOHERTY: "Was working on the roads. Prof. Shaw said the boys ought to strike against the butter and meat, as they were not good. Heard Prof. Shaw saying one morning he was not feeling well and had a lot of work to do. Heard him say last fall to the boys that perhaps he would not be here very long."

JAS. B. SPENCER: "Prof. Shaw said he had too much mechanical work in his office, which a secretary could do. He said he could make the cattle pay better if he had full control."

W. J. BROWN: "I spoke to Prof. Shaw about the sheep, saying it was too bad they were in such a condition. He replied that he was not responsible, that he had nothing to do with them. Another occasion I spoke to him about them, he said he gave the feeder all the feed he wanted, and I therefore inferred that there was something wrong, and that it would be better if he had control of things."

ALF. CHRISTIAN: "Prof. Shaw said that he knew nothing about a picnic lately here; that he didn't know the reason why he hadn't been informed."

FRANZ GRAESSER: "Was on train coming from Toronto after last Christmas. Prof. Shaw was also on. He said he had an interview with Hon. Mr. Dryden *re* a secretary; that he understood he would not get one, and said that there was little love lost between himself and the Minister. He mentioned the great amount of work he had to do; that he got up at five in the morning. Last fall, when working on the road, there was some conversation about the butter and meat. We asked Prof. Shaw what to do. He said to petition Mr. Mills, and that if there was no notice taken to send another in stronger terms, and if he still took no notice to come to him and he would tell us what to do. I tried to get up a petition, but the boys would not sign it."

GEORGE ROBERTSON: "One day Prof. Shaw asked what time we thought he got up in the morning. He said four or five o'clock. He had to do it."

SAMUEL MITCHELL: "Prof. Shaw told three or four of us, coming home from work last fall, that he should have an assistant, but didn't get one, although he applied. I thought that he was very unfairly treated."

F. T. LAILEY: "Heard conversation mentioned by Mitchell. Also asked Prof. Shaw why there was so much loss of cattle last year. He said it was owing to bad management; that he declined to take responsibility for cattle he did not buy; that they were controlled by the Minister. He said if he did not get an assistant he would not stand it."

W. A. KING: "Heard Prof. Shaw say he had asked for a secretary and did not get one: that he needed one. He said this to the students."

ROBERT BROWN: From Scotland; here nine months. One night Prof. Shaw came to his room to know what church he belonged to and to enquire about the bible class. This was about 9.30, during study hours. Brown said he was a Presbyterian. "He then told me he was not pleased with the cattleman."

CHARLES REINKE: "Heard Prof. Shaw say that the Minister did not use him as a gentleman, and did not use him as he might."

C. M. MACFIE: "After I came here last October, about the first intimation I had of lack of harmony was one day when I was working with Prof. Shaw along the lane. One of the students asked him something about the importation of cattle—whether there was more cattle being imported. Prof. Shaw said yes, there was some in quarantine, but that he did not hear anything about it till they were there. Prof. Shaw turned to the student and said, 'How would you like to be in that position, that is, running the farm and yet not running it?' Was working in Prof. Shaw's office, on the pedigrees. There was the Oxford Down ram brought out in the importation of last year. It was necessary to register it, and I was told to look up the necessary information with regard to registering these sheep. The pedigree was made out, and, knowing that there were four or five ewes of the same breeding, of a previous importation, I asked if their pedigrees were to be made out? He said, no. I asked if they were registered? He said, no. I asked him why they could not be registered? I forget what he said, whether it was that there was some foreign blood in them, or some other reason. I think he said the reason was that they were not pure breed."

Q. Were they good sheep?
A. Good looking sheep.

Q. Do you know from whose flock in England they came?
A. He gave me to understand that they came from a man whose flock was not altogether purebred sheep, at least I understood that.

"Regarding Prof. Shaw and the cattleman, Prof. Shaw stated that he would not hold himself directly responsible for the stock. He told me that he had stated that to the Minister. He said it was because the cattleman would not obey his orders. It was some time last winter. He said that the starting point was this, as far as I can remember: Prof. Shaw required a certain portion of the stables for an experiment, and the cattlman objected. Prof. Shaw gave him to understand that he was at the head of the department and could choose what part of the stable he wished. The cattleman said if he took that part of the stable he would send in his resignation. I believe that Prof. Shaw took that part of the stable, and the cattleman handed in his resignation. Prof. Shaw said he would not accept it. He said, 'You are in a passion now; leave the matter to morning, then come to me and tell me if you are of the same opinion.' In the morning, the cattleman said he wished his resignation to stand. I think the matter was reported to the Minister, with what result I cannot say.

I had to make a copy of the estimates for Prof. Shaw, and I noticed that the appropriation for student labor was struck off. I think Prof. Shaw told the students, simply in justice to them, that what was coming to them would likely be taken and applied to their next year's board.

I think I asked Prof. Shaw something about his idea regarding the student labor. He explained it to me and said that, as far as he saw, the farm could not pay for the student labor during the summer as heretofore, because the appropriation of $600 for that purpose had been struck off. I was asking different ones who would be the best lawyer to have. I asked Prof. Shaw what kind of a lawyer Mr. Field was. Mr. Newman told me Mr. Field was a good lawyer.

I said to Prof. Shaw that I did not think they could refuse us a lawyer. He said he did not think they could."

K. McNaughton: "I remember we were working in the gravel pit. Something had been said about fixing the road, and some of the students asked Prof. Shaw how long it would be. He said 'By the time you come back next year, this one will be like the one in front of the College.' This spring I said to him that he had not fulfilled his promise to us. He said 'They will not let me.' I thought the President perhaps had something to do with it. I remember what Prof. Shaw said in the class-room about Dr. Mills not keeping his engagement at the time of the plowing matter. At the time, I made some observation that I thought Prof. Shaw was expecting a little too much of the President. The Professor's remark had that effect upon my mind.

I heard Prof. Shaw say one day, after having been in poor health, that it was something terrible the work they put on him."

Robert McMordie: "I have heard that Prof. Shaw was overworked and a little about the sheep business. He was talking one day in the lecture-room and had some sheep in the class-room. I said to Stewart that the sheep were full of ticks. One of the boys asked him what would be the remedy for ticks. He said 'A new cattleman.'"

"At one time, he said that if he had a secretary, half the correspondence would be answered while he was away, which had to stand until he returned."

J. J. FERGUSON: "I was working in Prof. Shaw's office for two winters and many things came up. I put my afternoons in in his office, instead of on the farm. I remember Prof. Shaw making a remark about the President. He said, that in certain instances, under certain circumstances, he had not acted as one gentleman would be supposed to act towards another.

In connection with the estimates for this year they were cutting them down, and Prof. Shaw said, 'Well Ferguson, they have crippled me this time.'

The day Mr. James was up, arranging for the investigation into the McCrae matter, I told Prof. Shaw what we were going to do and he said, 'Ferguson, be careful,' then he mentioned something in connection with the work he had on hand, and said, 'Ferguson, the coils are tightening; they are getting me narrowed down closer every day,' or something to that effect.

I had a conversation with him the night the investigation was finished. He, naturally, wanted to know how the thing had been running. I just talked over the way it had been conducted.

There is a general impression around the College that the President is partly Minister of Agriculture as well as President of the College. Conversations with Prof. Shaw would, I think, make that impression on my mind. Prof. Shaw has informed me that the President is desirous of obtaining control of the farm.

I was working, helping to get out the pedigrees of the cattle from the Old Country. There were a few sheep to get registered, and we found they were not eligible for registration. Prof. Shaw made the remark that the Minister was rather a strange man to send to the Old Country to make purchases, when they could not be registered. The result of the remark was, that Hon. Mr. Dryden's ability to judge stock was considerably lowered in my opinion. They were the Oxford Down sheep."

"In reference to the registration of the sheep, rule 6, of the Record of 1884, says that animals descended from imported stock will be entitled to register, if satisfactory evidence is furnished as to name of breeder, etc.

On January 13th, 1891, a circular was sent out, which states, 'Animals imported from Great Britain must be recorded in the English Flock Book to be entitled to register in the American record.' I understand that Mr. Dryden was expected to know all these matters."

Prof. Shaw, in answer to the evidence of the students, stated as follows:

Q. You have been constantly impressing the students that you were hampered by the Minister—you always answered their questions and told them all about it?

A. Not always; in many instances I did not.

Q. You have heard the conversations the students have sworn to during this investigation—were they correctly stated?

A. I cannot recall what they said. I always talked of these matters to the students, in response to questions. My working with the boys, brings me very closely into contact with them. In consequence of that, they ask questions they would not otherwise put.

Q. You remember the Commission coming to investigate the charges against Mr. McCrae; you were in the library that day, with Sharman?

A. I cannot recall that.

Q. Did you say you thought McCrae should resign?

A. I do not remember, I will not swear I did not. Remember one of the students coming to my office and asking what they should do.

Q. Do you remember Burns asking you whether they should submit to the examination without a lawyer, etc.?

A. I do not remember that; will not swear he did not speak to me about it. I remember Newman asking me if I could name a lawyer in Guelph. Newman drove me to Mr. Field's office. I wanted to see him, I had heard there was the possibility of an investigation, and I wanted to consult him as to whether in that event, I would be allowed to have counsel, if I were involved.

Q. Did not Burns ask you whether they could have counsel and a stenographer, and you said you would consult your lawyer. He swore to that. You went and consulted Mr. Field, and told him the result?

A. No.

Q. Will you swear it is not true?

A. I swear I believe it is not true. I went to Mr. Field to consult him in my own behalf.

Q. You have heard me read the evidence of Mr. Burns—will you swear that it is untrue?

A. I believe it to be untrue—that part that relates to what I did in interviewing Mr. Field, for the students.

(Burns' evidence again read.)

Q. Will you swear that is untrue?

A. I swear I believe it to be untrue.

Q. You will not go any further?

A. No.

Q. Do you remember advising the students not to give evidence without a lawyer and a stenographer—will you swear you did not?

A. I will not swear I did not—I have no recollection of it.

A. I have told the students that I was not responsible for the condition of the live stock.

A. I may have said to some of them that he (the cattleman) was kept contrary to my desires.

Q. Have you told them about the Minister's refusal to give you assistance?

A. I think I told some.

Q. Have you told them that the action of the Minister was in consequence of the President's influence—you remember what Buchanan said?

A. I do not remember telling him that—I will not swear I did not.

Q. How did you find that out?

A. I cannot tell you.

Q. Have you not frequently said that the Minister was controlled by the President?

A. I can remember no cases.

Q. Is that your belief?

A. It is to some extent.

GEORGE A. BRODIE, one of the Commissioners proposed in the petition : "I think Prof. Shaw was overworked at the College. He had more lectures than his predecessor."

W. L. CARLYLE : "Prof. Shaw said that if he had more help in his office, he would be able to advance the interests of the College a great deal more. Drove Prof. Shaw's horse—got about $5 a month for it. He had a mass of correspondence to answer. I have sat with him answering letters till after 12. I answered letters that had accumulated for two months. He kept answering as he had time."

Q. You often drove Prof. Shaw's horse ?
A. For about two months.

Q. Did you ever leave your class to go and drive ?
A. Yes.

Q. Why ?
A. Because I supposed it was my duty.

Q. Who told you so ?
A. When I agreed to do a thing, I had to.

Q. Did you not know it was wrong to leave without a permit from the Professor teaching ?
A. I never left without.

Q. Did you always drive Prof. Shaw's horse on Government work ?
A. Not always—not on Sundays.

Q. Has he not a son who could do this work ?
A. I suppose so. His son was going to school at the time.

R. N. MORGAN : "Prof. Shaw said something about Barnett not being a proper man—asked for assistance in his office, but had been refused."

E. PERRY : "I observed a coldness and lack of fellowship between the President and Prof. Shaw when I was at the College in 1890 and 1891—no others. Prof. Shaw said he was curtailed in his work."

GEORGE MARSH : "There were two factions at the College—one supporting Dr. Mills, and the other supporting Prof. Shaw. I was of neither. While out around the farm during working hours, while working with Prof. Shaw, I have an idea that he said that he could not have things as he wished. I was here in 1885, 1886 and in 1891, 1892. There was an agitation among the students to have an investigation into the working of the institution and to give more power to Prof. Shaw. Most of those who spoke seemed to feel that he should have more power. Prof. Shaw said he could not get the money to do the improvements he wished to make—that it was not forthcoming. He thought he should have it."

D. BUCHANAN : "Prof. Shaw has spoken to me while I was driving his horse. He talked about the horse being moved from Dr. Mills' stable and about the cattle-

man—he said he had refused to obey orders, and he would not be responsible for the condition the cattle were in. I go around to the Institutes." Neither the Government nor Prof. Shaw paid him, nor did he ask them.

Q. Who paid your travelling expenses ?
A. The Bryant Publishing Company.

Q. Did Prof. Shaw pay your expenses ?
A. No, sir.

Q. You swear ?
A. There was once or twice a special rig had to be hired. I drove with them once or twice. He did not charge me for that.

Q. I mean, did he pay your expenses in going from place to place ?
A. No, sir.

Q. Nor your hotel expenses ?
A. No, sir.

Q. Prof. Shaw is a contributor to the *Live Stock Journal.*
A. Yes, sir.

Q. Who was it you chose as your Commissioners ?
A. We did not choose the Commissioners; but asked the Cabinet to appoint four ex-students, namely, Gibson, Raynor, Brodie and Sleightholm. He knew all these men personally except Sleightholm.

Q. Had you no ill-feeling with reference to Dr. Mills ?
A. I had not intrinsically.

Q. You knew that Gibson had an ill-feeling towards President Mills ?
A. No, sir.

Q. What was it then ?
A. That he considered President Mills the cause of the lack of harmony.

Q. You knew that Mr. Brodie considered Dr. Mills the cause of the lack of harmony ?
A. Yes.

Q. You knew that Mr. Raynor did ?
A. Possibly. I was under the impression that Mr. Raynor had this ill-feeling against the President. We could not make much mistake any way.

Q. At any rate, three of them, you knew, were opposed to President Mills ?
A. We thought we knew their views.

Q. Was it the desire to have President Mills removed ?
A. No, sir. It was to have the cause of disturbance removed.

Q. And what was the cause of disturbance ?
A. We thought that President Mills was.

Q. What about the boy riding up in the cart with Captain Clarke? Did you hear about Dr. Mills' son riding up with Capt. Clarke, instead of Prof. Shaw's son?

A. Yes, I heard about that. Willie Shaw told me that Captain Clarke had spoken to him, and said he was coming up and he would get a ride with him; and I think Willie said—I will not swear for his words—I do not know whether he told young Mr. Mills this or not, but I am under the impression that he did. He said that young Mr. Mills took a note down the following morning, or, at least, after that, to the Captain's house, and that he took it in—cannot tell where the note was from.

Q. Did Willie tell you the note was from the President?

A. No, sir.

Q. You told Holterman and others that?

A. If I did, that was not correct, because all that I know is, that Willie told me.

Q. And Willie did not tell you the note came from Dr. Mills?

A. I had no way of knowing the note came from him.

Q. You were not particular about saying the note came from him?

A. I did not that I know of.

Q. You have told it on the train and other places to prove what a bad man he was?

A. I never put it as a fact.

Q. You gave it as a thing against him?

A. Yes. I never gave it as a fact.

Q. And you never led any one to believe it was about that matter?

A. No; I do not think so.

Q. You swear you did not?

A. I know I made that statement.

Q. You say you told it to show what a bad man he was?

A. That is what it would indicate.

Q. You do not know what the note was about?

A. No, sir.

Q. The gist of your evidence then is that you wanted to get the trouble removed, and that the President is the cause of the trouble?

A. Yes, sir.

Q. You have stated that your object was to have the trouble removed, and that the cause of the trouble was the President?

A. That was my impression—I am satisfied of it.

Q. You told Mr. Bishop so?

A. Yes, sir.

Q. You say that the President controls the Minister?

A. I do not—I say that is my impression.

"We petitioned at the meeting with Mr. Drury in reference to hampering Professor Shaw and Professor Robertson. Professor Shaw was telling us as students working out, that he was going to put in so many acres of fall wheat. When he came to put in the crop, we could see as students that there were not nearly so many acres put in."

Q. How many acres were put in?

A. I know there were a less number of acres put in than Professor Shaw told us were to be put in. In reference to Professor Robertson and that petition, I cannot tell you exactly the trouble, but we were under the impression that he was hampered in his work.

Mr. W. J. PALMER: "Professor Shaw has frequently complained of overwork and lack of assistance. The first particular instance was in the spring of 1891. I can remember almost the day. I called at his office, and he said—as I remember it—that he found great difficulty in getting on with Mr. Dryden. He did not know why, but thought there must be something behind that. I think the cattleman was the trouble; and also about assistance—he had applied and been refused. I distinctly understood him to say that. In the dairy school, last winter, Professor Shaw said much the same—that he was hampered in his work, not having an assistant, and ought to have one, as he had more work and he would like to carry it on if he had one.

J. A. SLEIGHTHOLM: "Professor Shaw some weeks ago gave me to understand that he was being very much restrained in his actions, and that probably he might have to leave—because, I presume, he was not suiting those in authority. I understood that he referred to the bulletin of the lambs sent to the English market. Mr. Dryden thought very little of the experiment, that it did not amount to much, and that the balance was not on the right side. The bulletin, I understood, indicated that it had been. Buchanan told me this. Professor Shaw referred to the case of the herdsman and said that he would not submit to his directions."

Professor SHUTTLEWORTH: "Have heard Professor Shaw remark 'we cannot fill this College while President Mills is President.' That was in 1891 before I came here. Shaw said the President was an untrue man, and that he was a very clever man. He also referred to the bulletins and cattleman. He showed me some of his correspondence received from the Minister. Just after the committee of students returned from Toronto in the McCrae matter, and after the students had met and decided to return to lectures, Professor Shaw told me the students made a mistake—a great mistake; they had lost an opportunity. I wanted to know what opportunity and he said the opportunity by returning to lectures. I said I did not think the students had been acting in accordance with the rules of the College. I said I thought they had no right to take matters in their own hands and violate the rules of the College. They should have acted in accordance with the rules. Well, he said, under ordinary circumstances their course would not be justifiable, but under the present circumstances this course should be considered justifiable."

In answer to this conversation Professor Shaw stated, "I cannot recollect whether I said that. If I did say it, I meant that as they had been swaying first one way and then another, I feared they would not get the investigation."

"When the Commissioners came up to investigate into the McCrae trouble, in the afternoon Professor Shaw came into my office and said: 'Well, Professor Shuttleworth, I am very much interested in this thing. I don't know whether you are or not?' I asked him in what, and he said the investigation. That was the first knowledge I had of the investigation going on. Then he said 'I have come to ask your opinion on two or three matters. Is it fair to have students from both sides to give evidence in proportion to the number of students on both sides?' The other was having a single person, not one whom they could control. And the third was having two or three people present to look after the interests of the students. He mentioned Burns. He asked me if that would be fair? I said I want a little time to think it over. He pressed me a little and I thought it over. I said I disapproved of the whole student movement which would lead to greater difficulty. That I was not prepared to decide either for or against Mr. McCrae from the evidence I had heard. I said I thought it was my duty as a member of the staff to be loyal to the other members of the staff until they had fair play. I thought a thorough test should be made or examination into this difficulty before I could decide for or against. Professor Shaw said he was prepared to decide now on the evidence of the students."

C. A. Zavitz, College Experimentalist since 1886: "When Professor Shaw came here he felt that he was not well used by Dr. Mills when he came into the College. It was in connection with the room he had. He has spoken to me about this grievance of the cattleman refusing to take the assistant and I was present when he spoke to Barnett about the place for the experimental sheep. I heard the Professor say that he did not think it was fair that the Minister had a man under him who would not take his orders. He thinks that the Minister has not acted as a true man should towards him and he speaks in that way. I have, heard him make a statement like this, 'It is real inhuman to make a man go through the work I go through here and the Minister knows how much work I have here and would not give me help'; those were not the exact words; that was the impression he conveyed to me. He spoke very frequently in this way: He mentioned to me that the Minister had suggested my appointment to the full charge of the experimental department. He opposed the appointment under the way in which it was done. It would make his work less if the appointment was made. It is quite clear in my own mind that he thinks Dr. Mills is the power behind the Minister, that influences are at work through President Mills which are injuring him.

"He stated to me that he had received an offer from The Michigan Agricultural College of $2,500 a year. He said would it not be a good thing if something would come out in the paper regarding the men being here; about their visit and probably a little on the object. The object of their visit was to get Professor Shaw. The next day it was mentioned in the Guelph *Mercury*. I wrote the article. I might not have thought of it, if he had not said that about it. After that I heard that Professor Shaw was desirous of leaving in this way; if things were very pleasant he would not think of leaving because he thoroughly enjoyed the work, but the way things were he would rather be away than here. That was the substance of what he said. Professor Shaw got along with Minister Drury about the same as with Mr. Dryden. I certainly think there was a lack of harmony between them. I think he has spoken against Mr. Drury. I believe that Professor Shaw made a statement that he was not bound by the by-laws; that he did not consider that those by-laws were binding, that is until a year ago. The outside work I am sure has been hurt quite considerably by his not having enough help in the office. He has all the

correspondence which takes time. Mr. Putnam answers some; he dictates to Putnam. In the spring and fall letters flock in. The letters in reference to seed grain are handed to me and those from people who want to buy grain are attended to by him. Very frequently any correspondence asking about various kinds of grain he hands over to me. A year ago last summer Professor Dean wanted some hurdles across the road and he spoke to me, and I said I guessed he could have them. He did get them, and Mr. Story spoke to him, and I think there was not the best feeling just then."

JAMES MCINTOSH, Foreman Mechanical Department: "I have heard Professor Shaw say that he did not think he was getting fair play—he thought he was overridden. I do not know whether he had reference to the President or the Minister. I have seen him looking fatigued. He mentioned to me that he had 'too much to do."

R. F. HOLTERMANN: "Buchanan said that the President was not doing right with Professor Shaw. One of the things was in relation to some petty methods of not using Professor Shaw's signature and annoying him in connection with his son. It appears that Professor Shaw's son drove to school with Captain Clarke, and that President Mills wrote to Captain Clarke stating that his own son was to go up, and after that he did go. I understood that Professor Shaw had told Buchanan about this. He also stated that Dr. Mills had stated falsehoods and untruths that could not be proven. It is my opinion that these reports come from Professor Shaw."

J. E. STORY, Farm Foreman, said: "Prof. Shaw complained about losing his time in his office, getting behind in his work, and spoke about getting a boy to assist him. He said the last fall, when we were getting out the catalogues for the sale (when we were working all day, and day in and day out, and early in the morning), that all this could be done for a trifle with having assistance.

Last year Prof. Shaw complained of being hampered. I wanted him to buy steers in July for the Experimental Farm. I had one chance of getting a very nice lot of steers in August, but could not get the money to buy them. We could not get the money and had to let them go. I think Prof. Shaw complained to the Minister that he could not get the money to buy steers. I do not know how long after he gave information before he got the money. He simply said he could not get the money. He said the Minister stated that there was time enough. That is the reason I bought the inferior steers we have now.

The only time that Prof. Shaw has not got money when he asked for it was in the purchasing of these steers. I told him in August there was a nice batch of cattle if we could get the money. I think a few days afterwards he said he had talked with the Minister, and that the Minister said there was time enough to buy steers. I spoke in August; I waited till September. He then told me to let them go. Then about the latter end of September or into October I spoke to Prof. Shaw again and said that if we did not get our feeders they would be all gone. Then I saw him in October, I think, again and he said 'the Minister does not want to purchase.' Again, I think in November, I said, 'Now the good ones are all gone; I know of a car load coming from Manitoulin Island.' I wanted to buy ten or twelve; I wanted to use all the ensilage we had. We were limited to six and as a consequence we lost a lot of ensilage. I asked for ten. I told him we might as well have ten—we had room for them. He told me to purchase six.

Prof. Shaw complained to me about the President, the Minister and Prof. Dean. Prof. Dean sent a horse over to draw some hurdles away to make a division for green fodder on some part of the farm. I think Prof. Shaw had told me the day before to draw them away to some other part of the farm. Prof. Dean did it, I think, without Prof. Shaw knowing anything about it. I told Prof. Shaw; he said 'this Dairy Department is a nuisance; it is hard for us to keep up when they interfere with us.'"

E. L. HUNT, formerly Assistant Resident Master: "During the whole period of ten years have had talks about the agitation for an investigation. I have had talks with others about the unsatisfactory state of things at the College and the great discord and wrangling. I have had conversations with Prof. Shaw about the treatment he received from the Minister. He showed me letters he had received from the Minister, very hard—I think I might almost use the word insulting, letters. Prof. Shaw and I being very great friends, talked about these things in a very friendly manner. My impression was that the Minister had been poisoned against Prof. Shaw by President Mills in ways so skilfully hidden that it would be harder to lay your finger on it than to catch a flea. I know he had the same opinion that I had, that the Minister was biassed by the President, and he stated so."

Mr. JOHN I. HOBSON: "Last year Prof. Shaw had complained of too much work. He had applied for assistance, and we thought he had too much work. We thought it would be well to make another department—to start an Experimental Field Department and put Mr. Zavitz at the head of it (he was then occupying the position of head of that work). Then we wanted that the carpenter should be put under the control of the President.

"Prof. Shaw objected very much to Mr. Zavitz being put at the head of the experimental department, and because of that Mr. Zavitz was not appointed."

"Prof. Shaw and myself were appointed to purchase cattle for the farm. I thought we could get what was needed in Ontario and from among the herds we had inspected. We were instructed to purchase Herefords, Durhams, Black Cattle and Devons; but Prof. Shaw was anxious to look at some herd in Eastern Canada. I presume he wished to see the cattle, and I think he was anxious to go down. I did not go down—I thought it was unnecessary and am still of that opinion. I understood Prof. Shaw was a contributor to the *Live Stock Journal*, and there were some articles written by him when in Quebec. He said he was anxious to go to Quebec.

"The cattle purchased in Quebec were not better than could have been had in Ontario. I was anxious to purchase in Ontario for they were for an Ontario institution.

"I think we could have got Herefords in Ontario as good. There were the Western Herd and Fleming's and the MacKay's."

Prof. SHAW stated: "Mr. Hobson was not desirous of going to Quebec to inspect and purchase cattle; he did not think it was necessary. He thought stock good enough could be got in Ontario. I was writing for the *Live Stock Journal*, and gathering notes on these visits for the purpose of writing them up in the Journal."

Friction with Prof. Dean.

In his examination Prof. SHAW stated as follows:

Q. Have you ever had any friction with any one except the President?
A. I remember a difference with Prof. Dean in reference to the hurdles.

Q. You did not speak about him to the students?
A. I do not remember that I have done so.

Q. Will you swear you did not?
A. I will not.

Q. Or to ex-students or to outsiders?
A. I will not; I have no recollection.

Q. Why did you make this entry in your diary on May 10, 1893: "I noticed that the salary of Prof. Dean was being advanced and yet the students had refused to take his lectures." Why did you put that there?
A. You may say why did I put anything there.

Q. Did you want to show up Prof. Dean?
A. I felt that facts of the kind are valuable for various purposes.

About Leaving the College.

As to Mr. Zavitz writing in the Guelph *Mercury* with reference to his offer from the Lansing Agricultural College, the following examination of Prof. Shaw took place:

Q. Did you suggest that anyone should write to the papers—you heard what Mr. Zavitz swore to—are you prepared to deny it?
A. I will not swear that I did not do so.

Q. So that what he says is true?
A. What I say is, I do not remember having said so.

Q. You had spoken to Mr. Zavitz about the matter before it appeared?
A. Yes. I spoke after that about leaving to the students, the ex-students and others. I remember my reason for speaking in that way distinctly. The students were asking me if my lectures would be the same next year. I said if I remained they would not be the same as I intended to revise them. If they were to be the same they said they would buy copies of them. I said I did not wish them to go to that expense as I was not sure what my future would be; that I was not fully satisfied in every respect, and that I might possibly leave. It was after October, 1891, when I first made up my mind to leave if things were not different.

As to the Jersey Cow sold Mr. F. W. Hodson.

The following was given:

Prof. SHAW stated: "I thought the Minister reflected on me as to the sale of the cow. I think he stated that we should never have sold the cow, knowing

what we knew about her. The purchaser, Mr. Hodson, asked me particularly about her, and I let him know myself all about her. The sale took place on October 7th, 1891.

The facts relating to this cow are as follows:

Mr. Hodson, having purchased a Jersey cow at the sale on October 7th, 1891, sent her to Mr. Snell, of Edmonton, Ont., who, on November 18th, wrote as follows:

EDMONTON, ONT., November 18th, 1891.

MY DEAR SIR,—I am sorry to inform you that your purchase of the Jersey cow at the Agricultural College sale has proven unfortunate.

The cow aborted to-day, a bull calf, imperfectly developed, having no hair on it.

You were mistaken in thinking she was springing at the time of the sale; she showed no signs of this till the last two or three days, and not much then. She has very little milk, and what is worse, has one blind teat, which gives no milk and is corded, which is evidence, in my opinion, that it was an old trouble.

I write you thus early so that you may take what action in the matter you deem best, and I would suggest that the best thing to do is send her back to the College at once. I have a strong suspicion that this is not the first time she has "slinked," as you will remember she was dry when we saw her in the field in June, and she would not likely have been let dry so soon if she had been all right. Jersey cows are generally milked to within a month of calving. You probably know there were other cases of abortion last summer at the Model Farm.

Prof. Dean told us the Jersey cow in the stable had aborted, and there were hardly any calves about the place. The fact that the cow had a defective udder if it was not mentioned at the sale I think nullifies the purchase.

For my own part I must say I cannot afford to keep a slinker in my herd. I came through a siege of that sort of thing only two years ago, and I dread it more than small-pox. I shall keep her isolated till I hear from you, which I hope will be very soon. I think if you lay the matter fully before the Minister of Agriculture and the faculty they will at once agree that you ship her back, and that you should not pay freight either way. The only safe place for her is among the fat cattle at the College farm, and that is where she should go.

Hoping to hear from you soon, I am,

Yours truly,

J. C. SNELL.

F. W. HODSON, Esq.,
London, Ont.

On 21st, Mr. Hodson enclosed the above letter, with the following letter, to the Minister:

LONDON, Ont., November 21st, 1891.

DEAR SIR,—I enclose you a copy of a letter received from Mr. Snell on the 18th of November, also the copy of one written a little later though not dated. These letters will explain themselves.

You will remember of me telling you I bought a Jersey cow in Guelph. I knew at the time I bought her I had paid the outside valuation for her. Before bidding on her I made enquiries from Joe Barnett concerning her whether she

was vigorous and healthy, also if she were safe in calf. He gave me to understand he knew very little about her, and referred me to a lad who, he said, had charge of her and milked her. I spoke to him about her, but could find out nothing. Joe intimated to me that he thought they had some trouble with her udder. When I questioned the attendant concerning this he said they had had some bother, but it was all right now. He said the only difficulty was that she gave a large flow of milk at first, and being her first calf one of the quarters had swollen considerably. As I could not get anything satisfactory from the attendants, I went to Prof. Shaw and asked him if the Jersey cow which was offered for sale was all right and healthy in every particular. He assured me she was and that she was a good, fair, average milker and continued to give milk for a long period, and that she would be above the average when fully developed. When she came into the show ring nothing was said to the contrary; she was sold as a sound beast in every particular. I was also given to understand she was due to calve in the course of a week or so.

From Mr. Snell's letter you can see the information given me concerning this particular was incorrect. Though I had a very clear recollection of what Prof. Shaw told me, in order to be sure I had substantial evidence if necessary, I called on a gentleman who was with me when I spoke to Mr. Shaw. I asked him if he remembered the substance of the conversation. He said he did, so if it is necessary I can prove to you the correctness of my statements. I bought this animal in good faith and must trust to your generosity and that of Prof. Mills to do what is fair in the matter. I was asked to buy the cow by a gentleman west of London. When I returned home I told him I had bought her, but if he were willing I would keep her myself; to this he somewhat reluctantly consented.

I am now glad he did not get her as I would much rather lose her myself than have another person bear the loss by any action of mine. We intended, if she had gone along all right, to offer her and probably the calf as a subscription prize, but of course we cannot do anything with her now. If I cannot make some arrangement with the College authorities I will have to have her fattened, but I trust I will have no difficulty in arranging matters satisfactorily. Trusting to hear from you on this matter at your earliest convenience.

I remain,
Yours respectfully,

F. W. HODSON.

Hon. JOHN DRYDEN,
Toronto, Ont.

These letters, together with a second (the letter following) from Mr. Snell, on 21st, were forwarded by the Minister to Prof. Shaw for his explanation:

LONDON, Ont., November 21st, 1891.

DEAR FRED,—The cow will never be any use to you. It will be a year before she can come into profit if all goes well, and then ten chances to one she will abort again. Then you cannot sell a cow with a defective udder, no matter how well she looks.

I hope for my sake as well as your own you may succeed in getting an order to send her back.

Yours truly,

J. C. SNELL.

And on November 28th, Prof. Shaw wrote as follows :

GUELPH, November 28th, 1891.

DEAR SIR,—I now write you in reference to the Jersey heifer, "Oakla Belle, sold to F. W. Hodson at the sale last October.

I have made careful enquiry and find that "Oakla Belle" never aborted with us at any time. The only case of abortion of which I remember since coming to this farm was that of the other Jersey cow, as mentioned to you yesterday. This heifer was served March 20th, 1891, by our stock bull "Pogis of Flamborough." You will see from this that she was getting on pretty well toward the completion of her full time.

Mr. Hodson asked me about the cow before the sale. I told him, as nearly as I can remember, that we regarded her as a very rugged cow, but a little inclined to beefiness, and that she was only ordinary as a milk producer. He inquired particularly about her udder. I intimated to him that one teat was blind, or partially so, and that she had been troubled with a swelling in the udder before she got with calf at all.

I have, since seeing you, inquired carefully of Mr. Graham, our milker. He tells me that he got milk out of the affected teat till within a month or two before the drying of the cow, and that the milk obtained was all right, but less in quantity than from the others. She was dried about three weeks before the sale.

These are the exact facts so far as I can remember.

Your obedient servant,

THOS. SHAW.

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

To the foregoing letter, Mr. Hodson replied on December 1st, as follows :

LONDON, Ont., December 1st, 1891.

DEAR MR. DRYDEN,—Yours of November 30th just to hand. I am very sorry indeed that this cow business has occurred, as I would rather have had the difficulty with anyone else than yourself and the College authorities. I think I have been very badly used and must insist on having the matter put right. The statements made in Prof. Shaw's letter, a copy of which you sent me, are positively untrue. As I wrote you previously, that after trying unsuccessfully to obtain particulars from the attendants I went to Prof. Shaw, supposing he would have no object in lying about the matter. I asked him particularly if the cow was healthy, he told me she was. I intimated that I thought she was not a good milker. He said "she was a good, fair milker for a Jersey," and that he considered when she was fully developed; "she would be above the average." I asked him concerning the udder. He said they had had some trouble in that particular but that it was all right now and said it was caused by her giving a large flow of milk at first as we all may expect with heifers sometimes. He never intimated to me that she had had a blind teat, in fact he intimated to me just the reverse to be the case. I was particular and know when they once abort they are not usually valuable afterwards.

Certainly with one with an affected udder like this I would never try to get anything out of her but beef. Jerseys are different to Shorthorns in this particular, or in fact from any other breed of cows. Mr. Snell is pushing me to take her away. Trusting to hear from you soon and that you will give me definite instructions in this matter, I remain,

Yours truly,

F. W. HODSON.

Hon. JOHN DRYDEN,
Toronto, Ont.

Prof. Shaw, in his examination, stated that nothing was said publicly when the cow was put up for sale. He admitted he had told Mr. Hodson she was due to calve in the course of two or three weeks, when the fact was she was not due until 20th December—as was known by Prof. Shaw—being fully ten weeks.

His evidence corroborated his statement in the letter of November 28th. He admits that Mr. Snell has a good knowledge of cattle and that his statements could be relied upon. It appears that Mr. Snell's statement as to the cow aborting the second time was afterwards fulfilled.

The facts brought out in the evidence clearly show that the cow should not have been sold as she was, and especially under the circumstances mentioned by Prof. Shaw in his evidence.

TORONTO, December 3rd, 1891.

DEAR SIR,—I am in receipt of another letter from Mr. Hodson *re* Jersey cow. You will remember that I sent your statement of the case to him. He now insists that nearly all your statements are incorrect, and some of them he alleges are positively untrue. He claims that he has witnesses who would be able to speak in his behalf. The whole transaction is a most unfortunate one. I have no doubt in my mind that the cow is a defective cow; that she is no good for milk and may be diseased as well. Under these circumstances I do not think it wise to press for the payment of the cow, and I have written to Mr. Hodson stating that the animal may be sent back to the College.

When she arrives I must insist that she be placed in one of the empty boxes in the bull stable, and that on no account is she to be taken to the stable under the barn with the other animals. The herdsman will also receive instructions to have her fed as rapidly as possible and dispose of her for beef.

Yours very truly,

JOHN DRYDEN,
Minister of Agriculture.

Prof. SHAW,
O. A. C., Guelph.

Employment of Drivers.

Prof. Shaw employed as his horse drivers the following students: His nephew, who died, McCallum, Buchanan, Haight, H. Story, Newman, Carlyle, A. M. Soule, his nephew. He was not authorized to get these students, but Story,

the farm foreman, told him how Prof. Brown managed, and said that the Government paid them, and Prof. Shaw employed them and charged the Government for their services 25 cents per day.

The following evidence was given by Prof. Shaw:

Q. Is it not singular that all these men became opposed to the President and the Minister?
A. I do not think it is singular. It is a fact that almost all the intelligent students in the College having energy and grit took the same view.

Q. All these became bitter enemies?
A. I suppose they were the most intelligent; they usually became my drivers shortly after they came here.

Q. And afterwards they became bitter enemies of the President?
A. I think I am correct in saying that Buchanan, for instance, had taken part in a meeting or was on a committee at the time Mr. Drury requested to meet the students. That was before he drove my horse at all.

Q. He was opposed to the Minister and the President at that time?
A. Yes.

Q. And he is still opposed to them?
A. I suppose so.

Q. They became enemies to the Minister as soon as you turned against him—first Mr. Drury and then Mr. Dryden?
A. I cannot tell exactly their feelings.

Q. They have all expressed them and you have heard their expressions—you know that they are enemies?
A. I took it for granted that they were not favorable.

Q. You took upon yourself to take a student as servant and pay him at the rate of $91.25 a year from the Government funds without any authority?
A. I took it for granted—I commenced this at the first.

Q. Did you ever speak to the President about it?
A. I do not remember.

Q. Or to any of the Ministers?
A. I do not remember.

Q. Sometimes those students are taken from their classes in order to wait upon you?
A. It has occurred but seldom.

Q. Do you think it was fair to the rest of the students to pick out one and pay him—is that what they were here for?
A. The students have considered it a benefit every time financially.

Dr. Mills gave the following evidence:

Q. Had you any authority to pass the account for the horse driver?
A. I did not want to appear in a matter of that kind to cramp Prof. Shaw; but I thought it was a strange thing for him to hire the students in this way without saying anything about it.

Q. Did he interfere with the students by so doing?
A. They frequently left their classes. They were called upon at all hours and they went.

The Hiring of A. M. Soule, his nephew, who graduated June, 1893:

ARTHUR CURZON: "Last year I asked Prof. Shaw to be hired by the month. He refused on account of the money for student labor being limited. At the same time another student was hired and got in the neighborhood of $35. He was half the time driving or playing tennis. That was Mr. Soule; that was last year. Soule was hired for the destruction of weeds; he was first sent to Mr. Zavitz, and he would not have him, neither would Mr. Story. Mr. Shaw was appointed overseer of highways, and Mr. Soule was employed part of the time for that purpose. I saw him several times playing tennis when he should have been working. Prof. Shaw's son, Rob, said that his father spoke to Soule about not working.

SIDNEY CURZON: "I thought it strange that one should be allowed to work by the month—and he, himself, used to brag that he spent half the time sleeping and got paid for it all the same—that was Mr. Soule."

JAMES LINDLAY: "Last year I spoke to Mr. Story about working on the farm; he said he would like to hire by the month, but could not. He said that Soule had been hired by the Experimental the year before and had not given satisfaction there; he was always grumbling with other students, therefore Mr. Zavitz would not have him. He was sent to Mr. Zavitz and to Mr. Story, who would not put his name on the list. Mr. Story said he was going to work under Prof. Shaw, spudding, hoeing, etc. He drove Prof. Shaw's horse last summer, and in the mornings, if anyone wanted the horse, he drove. It sometimes took him nearly all the forenoons, and in the afternoons he would play tennis; I have seen him more than once. Prof. Shaw hired him. He sent him to Mr. Zavitz, who would not have him, and he kept him himself. Some of the boys were dissatisfied about it—they had to work for seven, eight and ten cents per hour and pay their board out of it. We knew that Soule was a nephew of Prof. Shaw, and it looked funny on that account. I understood that Prof. Shaw knew before Soule started that he had not given satisfaction the year before. When he was working he usually wore gloves in summer time, and the farmers passing along the road asked if this was where we kept the kid glove farmers. I remember Prof. Shaw asking me for information as to how Mr. Soule had been conducting himself during his absence. He said that from reports he had heard, he was not well satisfied with his work. If I remember aright, he said something about being aware that he had not given satisfaction the year before. Prof. Shaw told me he wanted to see me. He asked me about the work of Soule. He said Story had told him he was not well pleased, and had gone home on that account. In September we have to board out. It was not altogether on account of the work that I went, but if I had been hired as Soule was I would have stayed. He told me at the time he

was aware that Mr. Soule did not give good satisfaction the year before. He knew that before Soule started again this last year. Then he said something about how he was paid—so much from the farm and so much for driving the horse. Prof. Shaw said he was sorry he had hired Soule, but that since he had done so he had to give him work for the summer. He knew that between the time he hired him and the time Soule started to work. Prof. Shaw told me last fall that Soule got $32.50 a month, leaving out what he got for the horse. Prof. Shaw said Soule was hired as a farm hand. If so, why did he board in the College during July and August? Farm hands do not do that. Then he used to come in and brag about having such a slick sleep during the forenoon. A good many hours that Soule was driving the horse were put in in the forenoons and afternoons, during the time for which he was being paid $32.50 per month. Soule was hired the year before by the month, and was not through his College course."

A. M. SOULE was re-called by Prof. Shaw, in answer to the above evidence, and stated:

"Drove Prof. Shaw's horse. Two-thirds of the time the horse was out it was on Government work, that is, going to the station to meet visitors coming here to see the place; driving visitors about the place and taking them to the station. I received 25c. a day for this. I was employed to drive the horses about the end of June. Prof. Shaw had broken his shoulder. I did make a statement round the College here that I was sleeping when I ought to have been working. I had been out three nights together until twelve o'clock—two nights I had to take men down to the train and the third night I had to go down for Prof. Shaw's daughter. I had to get up at six o'clock in the morning and work hard during the day. I was out in the far corner of the field cutting thistles and it commenced to rain, when I sat down, I think I said I nearly went to sleep. I was under Prof. Shaw's care. I do not claim to justify myself for playing lawn tennis when I was hired here, but I wish to say distinctly that Prof. Shaw did not know anything about that. I remember one case very distinctly, I had to go to the city to meet a train and did not get back till four o'clock. I had to go back at five. I was not justified in playing that game of tennis. At the same time, I would have had to walk three-quarters of a mile to get at my work. Prof. Shaw knew nothing about it. He was not home on one or two occasions he was away two weeks, and during that two weeks the greater part of the lawn tennis playing was going on. I wore gloves when I was engaged spudding. The year before, my hand was calloused, and I thought I would get something to protect my hands. I was hired by the month on the first July at $32.50. I was also paid additional for the time I drove the horse, and got paid for working on the highway $13.75. Prof. Shaw paid me from the Municipal Fund, I presume, about October 1st, 1892. For working on the farm and for driving the horse, I received altogether $91.91 for nearly three month's work. I was paid $1.25 a day for the time I worked in June. I was under Mr. Story all the time in June, July and August—I was spudding thistles. Prof. Shaw hired me—Mr. Story did not employ me. He said after July there was no more work, but I worked on the farm, in his department, after that date. I paid for my board in the College three dollars a week. I was working in July and August and seven days in September at $32.50 a month. Prof. Shaw may have spoken to me about my negligence in the farm work, but to the best of my knowledge he did not. The work on the road was done in all the months—some in July, August and September. The bursar's statement when he gives me 7 days in Sept., 12 in June, 26 in July, and 26 in August, is not correct. When I was working on the road I was not getting paid on the farm at the same time."

Mr. STORY, in his evidence, stated :

Q. Was Soule working all the time ?

A. Yes, I guess he was. He was working all the time on the farm or driving Prof. Shaw's horse. I never saw him doing anything on the highway, but I think he told me about some work Prof. Shaw had left him to do on the highway. I never put his name on the book. I gave the bursar a slip, saying he had worked fifty-five days. There was something wrong. Mr. Shaw said I did not give him credit for all the work. He was paid for fifty-five days, and claimed he had worked sixty-six days. Prof. Shaw asked for Soule and Walker, he said they were specially good at spudding. I did not mention to anyone that Soule did not do his work right the year before.

Professor Shaw's Record Book.

The following 57 entries are taken from the 128 entries made in a record book by Prof. Shaw, commencing 28th November, 1889, and ending 12th June, 1893, and which book is inscribed as follows : "This book is intended to keep a record of various occurrences transpiring at the College and on the farm, prominence being given to those having an official bearing."

November 30th, 1889.—Heard last night through Rob and in other ways that the boys were about to draw up a list of grievances to send to the Cabinet regarding mismanagement of the President, etc., and that they contemplated asking the Central Farmers' Institute to move in the direction of the abolition of January vacation of the College. P. M.—The President interviewed me *re* the delegations to the Farmers' Institute. At noon, got a note asking me to try and commence lectures to the boys at once, in the mornings, in stables. I replied that I thought it unwise till we were ready to do the feeding properly—kept a copy of this letter to the President. Mr. Hobson called and told me what had been done *re* the purchase of cattle from Mr. Ellis, of Milton. I said I would write to the latter at once and did so.

December 3rd., 1889.—Mr. Drury, in Toronto, sought an interview to-day, asking me to go to his office—spent two hours with him. He questioned me in reference to many things about the College, and more particularly as to whether he had hampered me in my work. On asking what I thought was the real source of trouble, I replied that I thought it was the internal management.

December 4th.—To-day things running quietly, but was told by Mr. Ellerby that another petition of the students had gone down to Mr. Drury, with a long list of suggestions.

December 9th.—After returning from a Bible Society meeting in Shortreed neighborhood at 10 p.m., was sent for by Mr. Drury in the College, who had had an interview with the young men of the second and third years in reference to matters pertaining ultimately to myself. In the presence of Professor Panton and Professor James, he asked me what really was at the root of the trouble with the young men. I answered that I could only say again what I had said in Toronto, viz.: that I believed it arose from the internal management.

December 10th.—Was called in to an interview with Mr. Drury and the young men this morning at 8 a.m., in the President's office. They, with Mr. Rennie as spokesman, interrogated Mr. Drury and myself regarding many matters relating to my department, particularly in reference to the by-laws, the fall wheat, the barns and the purchasing of stock. It came out in the interview that Mr. Drury had not sent me a copy of the by-laws with the change in them relating

to my department and had not informed me that a change had been made. He promised to send me a copy of the by-laws as soon as he returned to Toronto. He told the young men that there would be full latitude given me in the management of my department. He also asked me to use my influence with the young men to keep order and maintain discipline, which I said I would do.

During the interview, he said to the young men that there never had been any serious difficulty between he and I and that we were on good terms—a statement which he must surely have felt was not true.

December 14th.—Got a letter from Mr. Drury to-day, insinuating that I was in a measure responsible for the insubordination of the young men at the College, and that he felt I was in some measure losing their respect, etc. In talking with Mr. Story shortly after, I asked if he knew how the students got information as to Mr. Drury's mind in reference to the wheat sowing. He replied, Mr. Mills had questioned him regarding the matter in the presence of the students. I asked him to write to Mr. Drury to that effect. The two shorthorn cows from R. Ellis, Milton, came to hand to-night at 8 p.m.

December 20th.—Called twice on Mr. Drury to-day, but he was not in office. Wished to consult him about buying steers in January, by Story, for 1890.

December 24th.—Interviewed President Mills regarding a change of the breakfast hour for the two men assisting in the work of feeding, etc. He proposed that they should board out, which so annoyed me that to some extent I lost temper. I am sorry for this. It was agreed that the breakfast hour should be changed.

February 5th, 1890.—Mr. Drury told me to-day that he could not consent to give me fuel and light along with the salary of two thousand dollars as the other professors claimed that they were entitled to as much. He told me that my salary was just as he had proposed to the Cabinet, although he (Mr. Drury) told me a year ago when I talked with him on the subject that it was the Cabinet which made the arrangement.

February 11th, 1890.—To-day received a letter from Mr. Drury of date February 10th, with the following: "This morning I received a portion of your report, which, after careful perusal, I have returned to the President, with a suggestion which I wish you would discuss with him. As this report appears to have been transmitted directly to me, I may add that all reports should be forwarded through the President."

I went over the report with the President and modified a statement regarding ox-eye daisy in the meadows, also a clause which referred to the fact that in some fields the thistles grew so quickly that we could only cut off the tops with the scythe and had to cut the grain green that was growing there. I also changed a clause in which I had said that during the present year we purpose "clearing eighty five acres, all of which was foul with thistles." The President said that my statements were perfectly true; but that it would give the Government away too badly to let it go as it was.

May 29th, 1891.—President Mills to-day hired Mr. Sleightholm for $1.25 to spread ashes. We were trying to hire him at the same time at ordinary student wages.

July 16th, 1891.—President Mills has taken more than one hundred posts from our pile to build a fence east of the garden along the lane. He did this without consulting me. The result is that our supply is now short for the Brock road.

September 26th, 1891.—A picnic came from Embro and neighborhood to-day, numbering more than 100 persons. No one in my department was informed of their coming nor was anything said to me about them by the President from first to last.

February 18th, 1892.—Hon. Mr. Dryden visited the College to-day. Went through the barns and looked at the stock with Mr. Barnett. I got no word as to his being present. Mr. Barnett told him, in answer to a question from Mr. D. as to what was wrong with the sheep, "that if he came oftener he would not need to ask that question, but would easily see for himself." In conversation of an incidental kind, I got this information from Mr. Yuill.

February 19th, 1892.—To-day I asked Mr. Barnett what was wrong with the sheep, they were looking so badly. He told me, in reply, "that is the question, what is wrong with them." I said, "is there anything else that you would like to feed them, for if there was, I would get it for him;" he said there was nothing. I then said, would he suggest no change; he said that it might be well to order some oilcake for the lambs when they came and the ewes after that season. I said I would get it.

May 12th, 1892.—Mr. Dryden visited the College to-day; spent much time with the cattleman, Mr. Barnett, but almost none with me.

May 13th, 1892.—Mr. Dryden spent much time with the cattleman to-day before taking the 8.50 a.m. train for Toronto, but none with me.

May 17th, 1892.—Mr. Dryden spent the day with Mr. Bruce, from Scotland. He never once asked me to go with him to attend to any departments, although he apparently visited them all.

May 18th, 1892.—Was told by Mr. to-day that Mr. Rawlings, of Forest, told him that I had not been giving the lambs fair treatment, and that he, Mr. Rawlings, had got that information from Mr. Dryden.

October 4th, 1892.—Mr. Putnam came in neither yesterday nor to-day to take letters.

October 6th, 1892.—Mr. Putnam did not come to take the letters to-day.

October 11th, 1892.—President Mills tells Story that he must have Mr. McNaughton and Mr. Wooley as specialists helping the carpenter, in the face of Mr. Story's remonstrance. His argument is that he must have them or we must do away with all special labor. This would trouble us exceedingly, but there is no special reason in his case, as Mr. McIntosh could claim special workers just as well.

October 13th, 1892.—To-day the Advisory Board sent for me before noon and talked the matter over of the removal of my horse from the stable behind the College. I explained to them that there was ample room for the horse, and that if my conveyance was in the way I would keep it in the implement house. They all said that that was reasonable, without a dissenting voice. After dinner, I requested an interview with Mr. Donaldson. He told me that it was then about decided that a stable would be built for my horse behind Mr. Story's office (a very out of the way place indeed), but did not give any reasons. I noticed the President was one of the company when I requested the interview with Mr Donaldson.

October 17th, 1892.—Mr. Putnam did not come to-day to take my letters at all.

October 26th, 1892.—Telegraphed as follows to the Hon. John Dryden, on the morning of the 24th, to Toronto, "Will I advertise sale in agricultural papers in November?" No answer yet to this telegram.

November 17th, 1892.—Mr. Putnam did not come to take any letters to-day. I was in my office the forenoon, the usual time for taking letters. In the afternoon have to be out almost every day. Would about as soon be without any assistance of this kind—it is so precarious to depend on—indeed rather as I am credited by the department in this way with getting assistance which I really do not get. It is fair to Mr. Putnam to add that he came in and took notes after the above was written.

November 17th, 1892.—Counselled with the President, Mr. Mills, this morning as to the sale of three grade steers. He said we might do as we thought best. I told him that we had an offer of 4.4 cents per pound from Leaman, of Halifax. He said to sell them, if we desired to do so.

November 30th, 1892.—Mr. J. E. Story tells me to-day that in the Bursar's office he was shown a letter by the Bursar from the Provincial Auditor, Mr. Sproule, to the effect that the dairy accounts had been returned to the amount of $70[illegible], odd dollars, which had been expended in excess of the appropriation.

December 7th, 1892.—To-day Mr. Putnam came to take letters; these were the first since November 12th, owing to a hurt to Mr. Putnam's shoulder. The interval was extraordinarily busy getting ready for the sale.

December 7th, 1892.—Sent first instalment of Annual Report to President Mills to be sent to Toronto.

December 7th, 1892.—Sent in all eight sketches of the weeds to Prof. James to-day.

December 8th, 1892.—No mail came to-day till near 4 p.m., every officer of the institution running three or four times in the interval to see if the mail had come. No mail at all brought this morning; very often no mail comes at noon till half past twelve, nor at night until half past six, which causes all the officers and workmen, or at least many of them, an extra trip to get the mail, and just because it seems good and convenient to James Mills, M.A., LL.D., to have it so.

December 9th, 1892.—Mr. Zavitz to-day asked Prof. James for bulletins on rape and got but 12 copies.

January 26th, 1893.—Yesterday went to Toronto to see if the Hon. J. Dryden would allow me to engage a young lad for my office, named Walsh, who can write shorthand and who also can typewrite. I said to him my work was accumulating so that I could not do it rightly without help, that letters were lying unanswered, and that people were clamoring for pedigrees which I could not get time to make out. I told him I could, I believed, get Mr. Walsh, who would answer my purpose, and that the outlay would not be more than $200 a year and the cost of a typewriter, which would not be more, probably, than $100. He told me, in reply, that if he granted me assistance of this kind, he must grant the same to other officers of the staff in due time, and it was an absolute necessity to keep down expenses. I said to him I could give more time to important work if relieved of much detail work, which an office hand could do just as well. I also said to him that I was giving the Government virtually every day in the year from 7 a.m. and often earlier until 10 p.m. He said those were too long hours, but still refused to give me authority to engage the lad or to buy the typewriter. He said something vague at the same time about giving the matter his attention in future.

February 18th, 1893.—The Hon. John Dryden visited the College to-day. He delivered an address to the students at the dairy. In the course of the address he commented on the live stock experimental work which had been done at the institution. He intimated that some of it did not meet with his approval. He instanced the cases of steers chosen for experiment. He said a price was put upon them arbitrarily at the commencement, and at the close they were sold for a higher price than other people could get for them, and on this basis the profit was reckoned. He intimated that it would be easy to pick holes in such experiments. This information was obtained from W. L. Carlyle, who was there at the meeting. Mr. Dryden had his stenographer with him, who was apparently engaged in taking down the address. The next day it came out in the Toronto *Mail* and other papers, but these allusions did not appear in it.

February 19th, 1893.—Mr. Putnam never came to-day to take letters, although every mail is bringing them in in very large numbers.

February 20th, 1893.—Yesterday Mr. Mills sent a student, Mr. Hay, to say to me that they would want a horse from us to-morrow and every week (two days) until the milk was all drawn for the Dairy School. I told Mr. Hay that I did not like to do business on Sunday, but that on the morrow, I would give the matter attention.

February 21st, 1893.—Mr. Putnam came to take letters to-day. One given him on a matter of some importance to the Secretary of Agriculture in the United States was brought to me for signature to-day, though given to him on the 18th inst.

February 21st, 1893.—I went this evening to see Mr. Mills in reference to his request of Sabbath evening that I should furnish a horse from our department to gather milk from the dairy school. I said that all our idle horses had not been fed for such work, and that all but two or three were too heavy for it, and that I thought the principle not a good one which asked horses from men who are regularly using them to put them in the hands of a strange driver. I added that I thought under the circumstances serious injury would come to our departments in more ways than one if thus called upon. Mr. Mills said that in cases of emergency it was perfectly legitimate to take horses from their regular drivers. In answer to my question as to whether Mr. Dryden said that we should furnish a horse two days in the week, he said "no," but that Mr. D. "gave it as his opinion that we should."

February 22nd, 1893.—Mr. Story informs me this morning that "old Fred," our farm horse loaned to the dairy department yesterday to gather milk, came home so worn out that he thought best to send for Dr. Reid. In conversation to-day, Dr. Reid told me that it was doubtful if "old Fred" would live, and that his illness had been caused by the outrageous work of yesterday in gathering milk in his unhardened condition.

February 24th, 1893.—Mr. Putnam did not come to take letters this forenoon, but I went over to the President's office with them in the afternoon.

March 2nd.—Mr. Putnam did not come to take letters to-day at all. I left word for him to come in the evening, but he excused himself on the ground of College duties.

March 20th, 1893.—Mr. Putnam did not come to take letters this forenoon. I went for him after dinner. He did not stay to take all my letters—said he could not. I went over to his office later and gave him the balance.

April 10th, 1893.—Noticed in the Estimates to-day that Prof. Dean's salary was being advanced $100, and yet the students of the second year have refused to take his lectures, and those of the other years do so reluctantly.

April 11th, 1893.—Mr. Keough complained to me yesterday that the two dogs which had been lying in his orchard were still lying along the road unburied, and he wished me as road master to see to it that they were removed. I called the attention of the President to the matter to-day. He coolly said I had better get some one to bury them, though one was the property of his own son and the other belonged to Mr. Harrison in the garden department and subject to his control

April 27th, 1893.—Mr. Putnam did not come at all to take letters.

April 29th, 1893.—Mr. Putnam did not come to-day to take letters until I sent for him about 4 p.m.

May 11th, 1893.—This afternoon the Presbyterian Synod visited the College. Mr. Mills did not let me know that they were coming and gave me no word when they were here.

May 30th, 1893.—I had been in the habit of conducting special lectures in the evening to first year students. I had one announced for the evening of the 30th. President Mills knew that such was the case, that is to say, he knew that I was giving those extra lectures right along to third year students. Without advising me in any way, he (the President) announced that he would lecture that evening to these students.

May 31st, 1893.—I had told some of the students, in answer to their inquiries of me, that I understood students would not get cash refunded to them at the end of the term, if their credits exceeded their dues in the College, but that the balance would be credited against the next year's term. I conferred with the President about this. He said that the balance due the students would be refunded to them to the amount of their deposit for the term if that were necessary. I asked him to state this to the class next morning at roll call, and added that if he would oblige me thus he would confer a favor. I was a little late next morning at roll call. The President, observing this, took the opportunity before the roll was called to harangue the boys in reference to lies that some busybody had been circulating about student work and refunds for the same. It had been the invariable custom previously for the President to offer remarks or make statements after the roll call and not before. The moment I put in an appearance the address of the manly President was drawn to a close.

May 30th, 1893.—Mr. Thos. Gibson, the assistant feeder, came in to-night and complained that Mr. Barnett was taking things easy and putting the drudge work all on him. This matter, he said, had been going on for a long time, but that he did not want to complain or he would have mentioned the matter sooner.

June 1st, 1893.—No mail to-night. There were games this p.m. at the College in which the mail carrier, John Hohenadel, was somewhat interested. Because of this the business of the College had to stand still, and everyone connected with it go without the evening mail. The mail man often comes up so early in the evening that a part of the mail is if the President's family wants special waiting on.

June 2nd, 1893.—As the mail did not come last night my correspondence did not come to hand, so that the secretary, Mr. Putnam, would have been of no use in answering the same had he come at the usual hour, 11 a.m. I told him so. We then arranged that he should come in the evening, and set the hour. He has not come, and as to-morrow a.m. takes me out of office, it being Saturday, my mail must go unanswered.

June 3rd, 1893.—On the evening of 31st May I called on the President to arrange about the ploughing examination. Some of the students were present by special appointment of theirs. We made it clear to the President that, although the students were getting the usual amount of instruction in ploughing, that it was not sufficient to make good ploughmen of those who previously had had no practice, and therefore it might be well under the circumstances to dispense with the examination. It was finally agreed, however, to hold it. Later the same day Mr. Ferguson and Mr. McCallum called on the President to confer with him further. They mentioned that they did not consider the amount of instruction sufficient to justify holding an examination, or words to that effect. The President asked of them a written statement. They began at once to see the hand of the ensnarer and did not give him one. He left the next day for Toronto on his way to Owen Sound, and he wrote the following letter to Mr. Ferguson:

TORONTO, June 1, 1893.

DEAR MR. FERGUSON,—I came here to-day on my way to Owen Sound to see the Minister, but he is not here. He is at home in Ontario county. Not having received any statement about plowing, I may say that I saw Prof. Shaw last night after you and Mr. McCallum left my office, and, after talking the matter over, we finally decided to reduce the maximum of marks in plowing and require 80 each in order to meet to some extent the case of those who complained so strongly of not having received anything like proper instruction in their subjects.

Yours truly,

JAS. MILLS.

To J. J. FERGUSON,
Agricultural College, Guelph.

June 5th, 1893.—John McMillan, M.P., of Constance, in conversation with Johnston E. Story, the farm foreman, at Montreal, in the Exchange Hotel, Montreal (Point St. Charles) used the following language: "God, Story, Prof. Shaw has been at the bottom of other things, and it leads me to believe that he has been at the bottom of this present riot." He (Mr. McMillan) referred to the charges which the Opposition were urging in Parliament in Toronto over the College and things appertaining thereto. He also said, when speaking of the roads made about the College, that "he (Mr. McMillan) could make the roads with less labor." The above conversation with Mr. McMillan took place on May 9th, 1893, and was told to me on the date which introduces this paragraph.

June 8th, 1893.—The County Council visited the College to-day in a body. They arrived about 3 p.m., were taken in charge by the President, and lunched by him before they went away. I was working just behind his horse stable and on the way to the experimental and within a stone's throw of the College. It was only by seeing them that I knew they had arrived. I was simply ignored by him in the matter throughout—was not sent for and of course not asked to lunch with them.

June 10th, 1893.—Mr. Putnam took no letters from me to-day. He was away at football match at Seaforth.

June 10th, 1893.—President Mills met a delegation of agriculturists from Britain in the forenoon. He then brought them up to the College and lunched them without letting me know that they were here. He then sent word to me in the afternoon to come and meet them. This was after I had made certain

arrangements with a number of boys to do a certain piece of work which was urgent, more especially in view of examinations coming off on the 12th (Monday). I did not go.

June 10th, 1893.—The public press stated to-day that H. Story, S. Curzon and E. Eaton had failed in their examinations in drawing and would be required to take supplementals, and that J. A. S. Burns had failed in his examination in Latin. The same evening Prof. Shuttleworth, in talking of the results of the examination with Mr. Story, the farm foreman, said that "It always reflected on the teacher when students failed." This remark seemed a little strange when taken in connection with the fact that three of the four who failed did so in the subject of drawing, a subject taught by Mr. Sharman, one of the ablest teachers at the College, but one who was known to be in sympathy with the boys who were lifting up their heads against hydra-headed oppression.

June 12th, 1893.—Mr. J. A. B. Sleightholm, B.S.A., of Humber, visited the College May 24th. He met the Bursar at the door of the College and talked with him for a short time. The President, who had been lingering around the door, then took the Bursar severely to task as to the purport of the conversation, and more than insinuated to the Bursar that the conversation had been about him (the President). The President added, moreover, that he couldn't see how it was the graduates were always talking against him. This information was conveyed to me by Mr. Story, the foreman, on the date mentioned above. The Bursar was his informant.

In referring to the memoranda written by him in his book of record; and which he declined to produce, until advised by his counsel to do so, Professor Shaw said he took a note of the times Mr. Putnam did not call to take his letters. He was asked if he took a note for investigating the matter—he replied, "I would not say that. I thought it might be of use. I thought trouble might arise."

Q. In what way?
A. I cannot tell.

Q. You had some object in view—what was it, in this case?
A. I do not think it would be easy for me to give the objects.

Upon the Commissioners announcing that there was no more evidence to be taken, Professor Shaw handed in the following letter:

GUELPH, 6th July, 1893.

John WINCHESTER, ESQ., Chairman Royal Commission, *re* investigation of matters pertaining to the Agricultural College.

DEAR SIR,—At the outset of this investigation, as you know, the Commission sat in Toronto, for at least a part of two days, before I had received any intimation from your Commission that an investigation would be held.

During the aforementioned days I am credibly informed that my work and department as Professor of Agriculture and Farm Superintendent at this Station were made the subject of most careful scrutiny by your Commission. Dr. Mills, whose conduct is also the subject of investigation, was allowed to be present from the first.

Furthermore, I have sufficient evidence to lead me to believe that he (Dr. Mills) had been apprized of the intention to hold an investigation some considerable time before the work of investigating was entered upon by your Commission. He had, therefore, ample time given him to prepare his defence, a privilege which was not accorded to me, although my work and department have been made the subject of at least equally careful scrutiny, by your Commission.

I therefore ask the privilege from your Commission at this stage to record my protest against the unfairness and discrimination manifested by the Commission in opening and conducting an investigation as stated above.

On the ground of Anglo-Saxon fair play, I ask it, and, in the interests of truth and justice, I ask it.

Trusting, therefore, that this letter will be entered along with the minutes taken during the investigation,

I have the honor to be,
Yours respectfully,

THOMAS SHAW.

Whereupon the following took place:

Q. Wherein have you been unfairly or unjustly treated or prevented from giving all the evidence you desired to give.

A. I claim that I was unjustly treated in the investigation commencing its work in Toronto and taking evidence against me, for at least part of two days, without my having been apprized of the investigation.

Q. Was there any charge made against you that the Commission was directed to inquire into?

A. I do not know about that.

Q. Did you know of any charge made against you, that the Commissioners were required to investigate?

A. I did not know of any.

Q. Did the Commissioners not tell you that there was no charge made against you, in the first place?

A. But they sought evidence that would implicate me.

Q. I beg your pardon—they did not—they told you the moment they came here that the evidence taken in Toronto was taken there for the purpose of preventing expense. The young men were there on their way home—some to the North-west and elsewhere; that Dr. Mills was not invited there and was not there from the very first.

A. President Mills was there part of two days.

Q. But not from the first—you could have been there, it was an open investigation—your son was there from the very first. Is there any evidence you wished to call that you have been prevented from calling?

A. No.

Q. If there is, we will hear it. Is there any other evidence you wish to give?

A. No, sir.

CONDUCT OF MR. H. B. SHARMAN.

With respect to the conduct of H. B. Sharman, B.S.A., Assistant Chemist, the following appears in and has been taken from the evidence:

ROBERT HARCOURT: In referring to two letters he had written to the press contradicting a statement made by Mr. Awrey, M.P.P., in the Legislature, said, "I did not mean the letter to be taken up in the way it was—the statement was made in the newspaper that we had asked for Mr. Hunt's removal within two years. I meant simply to say we had not done so within that time. I did not intend to deny the statement. I was talking to Mr. Sharman after dinner that day, he said, 'There is a thing Mr. Hunt can't do himself.'"

Q. Then Mr. Sharman suggested it to you?

A. Yes.

Q. Otherwise you would not have troubled about it?

A. I was thinking about it, but I did not think seriously about it till I saw Mr. Hunt's denial of the part calling him a traitor. In conversation with Mr. Sharman afterwards this was mentioned, and he suggested that I might do that. I showed the letter to Mr. Sharman before sending it to the papers; he corrected it. I was one of the students interested in the petition against Mr. McCrae.

Professor SHUTTLEWORTH, in his examination, stated: "I saw Sharman in the laboratory with Harcourt a day after Mr. Awrey's remarks in the Legislature. I was in the adjoining room. Sharman said; 'it matters not one iota whether that petition was sent two years ago or not.' They spent about half an hour there. The next day Harcourt came in again and spent another half hour. Next Mr. Harcourt's letter appeared in the paper. I thought then that the letter was being talked over."

In reference to the above, Mr. Sharman, in his examination, stated: "Harcourt's evidence as to my speaking to him with reference to the letter to the papers is correct. I revised both his letters. I was responsible for both of them. It was in consequence of my great intimacy with Hunt that I considered him at all."

R. HARCOURT also stated: "I desire to make a statement in reference to the examination of yesterday. I answered one question in a way that I could not allow to stand as an honest man; it was as to my conversation with Mr. Sharman on the McCrae question. I said no, but I did have conversations with him, and I thought I should make it straight with you. The first talk we had was one night when Sharman came up to my room and the McCrae matter was mentioned. He knew nothing about it. I was telling him of some of the facts. That was all at that time. That was at the beginning of the trouble. The tenor of the conversation was that if Mr. McCrae was not giving satisfaction, as was apparent, the boys were quite right in going on with the petition against him—not their petition but their working against him. . .

Q. Did Mr. Sharman take any active part with the students after they had been in Toronto?

A. Well, this advising that I was speaking about was after that, while the investigation was going on.

Q. He was urging the boys to go on with their agitation to remove Mr McCrae?

A. He said to me that as a student he was doing that. Those were the words. I do not think he ever said he wanted him dismissed. What he spoke of was the investigation. I do not think that he was strongly in favor of it.

Q. He wanted the boys to continue their petition for Mr. McCrae's removal? A. Yes; he thought the investigation would be partial, being appointed by the Minister of Agriculture.

With reference to the above Mr. Sharman stated: "It is not true what Mr. Harcourt says, that I told him that I was urging the students to go on and remove Mr. McRae. I did nothing approaching that. What I said was the opposite. The question was one of investigation, not of removal. I did not say anything to indicate the investigation would be partial. Mr. Harcourt evidently has been under some mistake. I did not advise with Harcourt nor advise him. There are some points it seems in which it is impossible to make myself and Mr. Harcourt agree."

Mr. J. A. STEAD BURNS, referring to the inquiry with reference to Mr. McCrae, stated: "I spoke to Mr. Sharman about the matter. If we could not have a lawyer we wanted one of the students, and I was talking of the best man to have. He advised that I should go myself. He said I would be allowed to hear the evidence given and probably to ask questions to bring out any evidence, but that one's powers were limited. He told me that he wanted an investigation to clear himself of the charges made against him. (It was stated that Mr. David McCrae had said that Sharman had instructed the students to petition against his son.) He outlined the conduct of the students so far as I have said, that we should go to the Minister and that if we did not succeed we should apply to the other members of the Council. We followed this course."

Professor SHUTTLEWORTH, in his evidence, referring to a conversation in the Chemical Laboratory about the McCrae matter, stated: "Prof. Shaw had said that when a teacher fails to keep the confidence of the students, to have the respect of the students, that teacher should leave. I said I was not prepared to say that. I said that Mr. McCrae came here under great disadvantages; he is unpopular with the students; that probably in time he will overcome that difficulty. I gave an instance—Mr. Hunt's unpopularity at first and his great popularity at last. Sharman, who came in while we were talking, said the cases were altogether different. The class of students who object to Mr. McCrae is altogether different to those who objected to Mr. Hunt, and I think he asked me if that is not the case. The discussion became heated, and something was brought up about President Mills. Sharman called him a liar. I said, 'Sharman, I cannot stand that in my office without reproving you.' He said, 'Mills is a liar and I can prove it.' I asked for his proof and he gave me two cases. I said, 'I have been a long time in the College and I cannot believe he is a liar until I find it out.' One of the cases he referred to was the interpretation of the telegram, and the other was that President Mills said that he did not know what side some of the students were on, and Sharman said Dr. Mills was false there because he knew perfectly well which side they were on. Sharman is my assistant in the laboratory, and a number of students came to him frequently during the McCrae trouble. Mr. Newman in particular came so frequently that it roused my suspicions. Mr. Bell came. After Easter Mr. Newman, Mr. Ferguson and Mr. Burns came more frequently and Mr. Macfie occasionally. Soule still used to come in just occasionally. The students who were appointed on the committee were the ones always to come. They had no business there excepting Ferguson, who came to us every afternoon and worked with Mr. Sharman. I once said to Sharman that I thought the officers should not take the students into their confidence when talking College difficulties. I remember a remark made by Sharman that the students were tired of meetings and should hold no more meetings, but six or eight of them should work secretly together

in the matter. Newman went down into where Sharman was working in the laboratory, and the reason I wished to remember it was that the visits were so frequent that I thought it to be my duty to report to the President what was taking place in the laboratory. I was told by the President that the Commission would certainly require evidence of this matter. And another thing, apart from everything else, I was desirous of knowing what was in the wind, and I impressed that conversation upon my mind for the purpose of giving that as an example. I heard Sharman say, 'Did you have a meeting last night?' and Newman said, 'The boys are tired of meeting,' and then Sharman said, 'Don't hold any more meetings—do the work amongst eight of you.' This was between James' visit and the investigation. Newman went out and Prof. Shaw and Sharman had a conversation. I scarcely heard anything Prof. Shaw said, but Mr. Sharman spoke in a loud tone and that is how I heard it. The first sentence was, 'Did you see the Toronto papers?' I could not hear the answer. The next was, 'Could they be registered without taking prizes?' The next sentence was, 'Are those answers going to be taken as final?' Mr. Sharman said, 'Oh, no.' The next sentence was, 'Have the men backbone?' The next was—Sharman said, 'Keep at it.' Prof. Shaw said, 'Yes, yes.' I think Prof. Shaw was reciting or reading something to him, and Mr. Sharman said, 'I sent two there.' He did send two letters that morning to Mr. Hunt, and I posted them. The day Prof. James came up he came in and asked Mr. Ferguson to meet in the evening with the others. Just as Mr. Ferguson was leaving Mr. Sharman said to him, 'State your case exhaustively.'"

C. M. MACFIE stated: "I had a conversation once or twice with Mr. Sharman. I was in the library one day and Mr. Sharman was stating to me a few things regarding the matter. He said that many students had come to him from the time Mr. McCrae had been appointed and had complained about Mr. McCrae's inability to teach. Mr. Sharman told me he had put them off on several occasions. He said that he did not want to be a party to anything that would lead the students to take action. He said he had been accused of being at the bottom of the whole affair. Now, he had been so accused he said it was not his duty to keep perfectly quiet about it, but he had to vindicate his own position. He then described to me how the appointment was made. He said he was the first to know of Mr. Hunt's resignation and had not the least idea of applying for it. He was in Toronto at the time, and when he returned the President, I think, had asked him to apply for the position. Two of the third year students were in the city one day and, I think, met Major Davidson, and he said to them, 'You fellows want to get McCrae into this position; he will be a good man to have in connection with the battery.' I think he held an office in that connection. Coming up one of the students thought that Mr. Sharman might want the position, and he came over and proposed to Mr. Sharman to apply for it. Then he was active in getting up the petition presented to the Minister for Mr. Sharman's appointment. I think he told me that Mr. David McCrae had accused him of being at the foundation of the charges against Mr. John McCrae. Mr. Sharman told me that this was the first intimation he had of the action being taken by the students. We had two or three conversations in the laboratory. I have described the substance of one. Another was about the way that Mr. James received us, and that I thought we were going to have fair play. I think he wanted to know what line we were going to pursue when the investigation came. I think I told him."

Q. Did you tell Mr. Sharman that you were wanting the dismissal of Mr. McCrae?

A. Mr. Sharman knew that before I was talking to him.

Q. Did he not tell you that if Mr. McCrae was not giving satisfaction the boys were quite right in going on with the petition against him—were not those the words ?

A. I think that was the tenor of his words.

Q. When did he make such a statement ?

A. I will not say whether on that occasion or not.

Q. Well, on any occasion ?

A. I think he did either at that time or at a later time.

Q. What was the conversation about ?

A. About general matters concerning the investigation. I think he wanted to see the students successful. That is not what he said, but I think I could draw that from what he did say.

Q. The result of what he said was that he was desirous of seeing the students successful in having Mr. McCrae removed ?

A. That is the impression I had. I think I heard that from another student, not from Mr. Sharman.

Q. He wanted the boys to continue petitioning for McCrae's removal ?

A. It strikes me that someone told me that.

Q. Did he say that the investigation would be partial and that he did not want it ?

A. He said that if he were in the students' place he would try to have the witnesses put upon oath before the Commission. I told him we intended to do that if possible. He told us to make out a statement of the students according to the examination lists to show who were on the proficiency lists among the satisfied and the dissatisfied ones. That the investigation be conducted after four o'clock in order that the third year students might give evidence without interference with their examinations, and that Mr. Burns might be counsel. He suggested to me the names of certain witnesses from the different years—Robert Shaw, Beckett, Soule, Burns, Story, Harcourt, Bell. I think that was all the third year men. In the second year, Ferguson, Atkinson, McCallum—these were the first three on the proficiency list. In the first year there were myself, Newman and Comfort.

Q. Did he suggest the witnesses for the defence ?

A. Yes, one—Mr. Kennedy. He said it would be best to ask to have him called for the defence because he thought that his evidence would assist the prosecution.

Q. Did Mr. Sharman tell you that ?

A. Yes, he suggested that.

Q. You say that he suggested that you call Mr. Kennedy as a witness in behalf of Mr. McCrae when he knew he would prove a better witness on behalf of the prosecution and so stated to you—was that honorable ?

A. (No answer.)

A. He suggested that we question the Commissioners as to the relative value they would place upon what they saw of Mr. McCrae's teaching and what they heard in the evidence. That was all the second conversation.

J. FERGUSON: We discussed the McCrae trouble with Sharman before Mr James came up to the College and after we went to Toronto. The substance of the conversation was that in Mr. Sharman's opinion the boys were right in the course they had taken. I think it likely, he said, that the investigation was a partial one. He said that knowing the men with whom we had to deal we had better be careful—he referred to the Minister, Mr. James, Mr. McCrae and Mr. McCrae's father.

On the day of the investigation I was lying on the grass and Mr. Sharman passed. I said I thought it was a gone case. He said something to the effect that that was what he expected.

Sharman said we were right in demanding a stenographer, a counsel, and to have the evidence taken under oath.

He said it was a glorious sight to see the Commissioners start off for Toronto without doing anything. I do not think that Mr. Sharman gloried in the fact that the Commissioners were going home to Toronto without doing anything; I think he felt that looking at it from the student standpoint, it was a fine thing for us. He said he would not go surety for the veracity of the President's word on all occasions. At a meeting the third year decided they would go in with us, even though they were through with Mr. McCrae, and have their names sent in to show whose side they were on. They went into the President's office and they came out without doing so. Prof. Shaw said he was sorry to find they had not strong minds of their own.

I was no longer than 15 minutes in conversation with Prof. Shaw at the time referred to by Kennedy.

Mr. SHARMAN, in his evidence as to the above, stated as follows: "I knew that the students had decided not to take McCrae's lectures; that the president had told him so; that they had gone to Toronto to see the Minister; that they expected an investigation. Some of the conversation I got from the students. The first I heard of it was about a week after it commenced. Newman was the first who told me about the matter. There were other students spoke to me while working in the laboratory. I did not advise them. I did not speak to any from first to last; they spoke to me. I was at no meeting of the students whatever, and no committee whatever, I knew what they were doing. I don't think I encouraged them. The substance of all that I have said was that if you followed those lines you would be following lines that would reveal the truth; the lines that were suggested and stated by Mr. Ferguson. Mr. Macfie is correct in his evidence as to going over the line of attack with me. I was not the originator. Of course it does not matter. I would just as soon have originated it as agreed to it. One of the points discussed was as to who was to give evidence. I told them I thought they were entitled to employ counsel and a stenographer, and that these privileges would probably be granted to them; that I regarded them as just. And they would probably be allowed at the investigation. I gave them the following words of encouragement: 'Keep up your courage; acquit you like men; be sure you are right then go ahead; but be sure you are right.' I had a good deal of feeling in the McCrae matter. I felt that I had been unjustly charged and that it had done me a great deal of damage. I cannot recollect making any distinct statement advising them to go to work in a secret way, or that their object would yet be defeated. Quite probable what Mr. Ferguson said I said to him on the day of the investigation was quite true. I never said it was a glorious sight to see the investigators go home. Mr. Ferguson was decidedly mistaken in that. These words were said by Mr. Ferguson to me. I did not agree with those words at all. I would likely have said it was about what

would be expected. If I said that, I meant that I had seen petitions and student movements during the ten years I was here and felt quite confident unless they were absolutely and clearly right, there was not the slightest chance of success. Rightly or wrongly there is no question in my mind that the mass of the students every year have a feeling that President Mills is not a true man, and that Prof. Shaw is. My own feeling, the impression which the President makes on me is and has been the same over and over, and always has been, that he is not a true man. Ferguson, one of the students, said that he found the President to be false. He said, 'He is out and out false.' I said, 'Ferguson, I have known the President to be mistaken the same way in the past.' It was about the interpretation of the telegram. The evidence upon which I based my statement that Dr. Mills was not a true man, is the evidence which Prof. Hunt gave, and which he told me previously. Prof. Hunt and I are one. He is almost myself. I will say I counselled with the students about the McCrae matter."

As to Mr. Sharman's connection with the register of ex-students, the following evidence was given:

L. G. BELL stated that he had charge of the register containing the names of ex-students; that he lent it to Mr. Sharman, and afterwards, when he asked him for it, he said it would be back in a day or two. He then asked him where it was. Sharman said he had better not know. Witness stated that he did not tell the President he had given it to Sharman, because he had promised not to tell; that Sharman asked him in directly, through one of the other students, not to tell. When speaking to Sharman, he told him he had not told anyone, when Sharman said, "That is right, don't tell anyone."

With reference to the above Mr. Sharman said: "Mr. Hunt wrote to me asking me to send the register of the graduates to Mr. Morgan, which I did. I got it from Mr. Bell and sent it to Mr. Morgan by express."

"Afterwards Bell told me that Putnam (the President's Secretary) asked him for the register to send reports to the graduates of the College. I told him that I could not give it. I supposed that I would get it almost any time I would give it to him as soon as I got it. Moreover, I told him that I wished him not to say to Putnam that I had got the book. I told him that because I expected if it became known that I had got the book and it was in my possession, and had been for some time, it would be surmised or supposed that I had something to do with it, and that I was the prime mover in the efforts to have an investigation. I told him to keep quiet. I did not tell him the President had no business with the book. I did not tell him it was better for him not to know where it was. When they came for the book I kept secret about it, but previously I did not."

CONDUCT OF J. E. STORY.

With respect to the conduct of J. E. Story, Farm Foreman, the following appears in the evidence taken:

J. FERGUSON: "Story told me in one instance that he would not be here very long if the President had control of the farm. He said that Prof. Shaw was being hampered in his work, and that it was a crying shame that the cattleman should be retained in direct opposition to the wishes of Prof. Shaw. On the day

the members of the Legislature visited here I had a conversation with Mr. Story about showing them round. Mr. McLenaghan, our member, inquired where I was. Story said, if it came up in conversation, just let him know how this lack of harmony stood. I did speak to him about it. He was asking me how Prof. Shaw was getting along. Story has informed me that the President was desirous of obtaining control of the farm."

K. McNAUGHTON, Student: "While we were putting up the silo, I was talking to Story, and he said the President was very foolish to put up so large a silo with only three acres of corn. A day or two afterwards some one mentioned it to the President. The President said we will see about getting more corn than that. Story said that he would not get the corn from them, and would only have three acres. I went home, and when I came back the silo was nearly full. I understood from Story afterwards that he gave him half the corn, and was dissatisfied at the way he was credited for it. He said that the farm was credited in the labor, but in such a way that the public would not understand it—or something to that effect. I rode up from the station with Prof. Shaw and Mr Story. It appears that the liquid manure pipes used to be kept in working order by the other cattlemen, and Story was telling Prof. Shaw that they were not working owing to the carelessness of the cattleman. I think Prof. Shaw asked Story to be sure that such was the case." [redacted]

ROBERT McMORDIE, Student: "I think I know of an instance between Mr. Story and the President. Kennedy had not been attending work for two weeks before the examinations, and Story had fined him. He got tired of that because, he said, the President had been removing fines. Mr. Story said he informed Prof. Shaw about it, and Prof. Shaw told him to strike Kennedy's name off the list. It was struck off."

Mr. KENNEDY: "President Mills did not remit any fines for me this term. I never asked the remission of any. I am not aware that my name was struck off the work list. The only case I remember quitting work was one afternoon I went down town to get a cheque cashed. The President saw me and asked me what I was doing. I told him. He said that was not right."

Story, in answer to the above, stated: "I think I fined Kennedy several times. I did not say to McMordie that Kennedy had his fine remitted. I said to McMordie; 'will you take his place; Kennedy is not here to-day.' He said, 'why don't you fine him?' I said I had quit fining him. The boys laughed at it. I never knew many instances of fines being remitted without my consent. I spoke of Rice to McMordie and not of Kennedy. I do not know of any other whose fine was remitted. I based the statement I made to McMordie on this single instance of Rice. I did not stop fining, but I did to a large extent; I did not fine so much.

C. M. MACFIE was working in Prof. Shaw's office about the time the estimates were being sent down to Toronto. "A few days before, Mr. Story told me that Mr. Dryden had struck off the appropriation for student labor for the holidays. He told me this incidentally. I think I asked him whether many boys were going to remain during the holidays.

From what was said to me I judged there was a lack of harmony between Dr. Mills and Mr. Story. Story complained that certain students went to the President and had their fines taken off after he had fined them for not attending work. I do not know whether it was true or not, but one student was

fined for using profane language. His name was Rice, of Toronto, and he boasted among the students that he had the fine taken off."

R. HARCOURT: "Story told me last fall what has been said about the cattleman."

JOSEPH VIPOND: "At the time of the visit of the members of the Legislature, Mr. Story asked me who was my representative, and said, 'will you show him around through the stables when he comes; be sure to show him how the stock is managed here;' he made reference to some of the animals being too fat."

Mr. Story, in reply, said Prof. Shaw told him, when the members of the Legislature were visiting the College this last spring, to see that the members went through all his departments. I said, "the boys will do that." 'Well," he said, 'tell the boys to go through with them.'"

Q. Why did you tell Ferguson to tell his member of the difficulty about the College?

A. I never did it.

Q. Did you not tell Vipond to be particular to show Mr. Magwood, his member, the lumps on the cattle's sides?

A. I said to one of them, "See that the members go through your departments." Prof. Shaw said that if we did not do this the members would be taken over to the dairy, and that was all there would be about it.

Q. Do you not remember telling Vipond to be particular to show the members the lumps on the cattle's sides?

A. I said if half the farmers knew how these cattle were kept they would not buy them.

Q. I think you spoke to Werry—what did you tell him?

A. Werry and Newman were standing together and I said 'Prof. Shaw wants the members to be taken through the departments as well as on the other side of the road, or else, Prof. Shaw says, they will be taken over there and see nothing here.' Mr. Story said he had had conversations with Prof. Shaw every day about lack of harmony, but could not recall any one of them, although pressed to do so.

Mr. MACFIE: "Was working for Story one day and asked him why they did not keep the back part of the farm in better shape. He said that they had not the money to do it, and that the Minister wanted to sell that part of the farm. I said: 'That is not Prof. Shaw's anticipation, is it? He said: 'No; he wants to buy the whole block.'

He said several of the students had been complaining of getting such low wages when working on cattle; I complained myself. I asked him how it was. He said, according to their orders, they could not give any higher wages to students working on cattle. He said the cattleman was paid so much for instruction and the orders were that since the students were receiving so much for instruction, on cattle, their wages should not be high. I said I never received any instruction. He asked me if the cattleman never gave it, and I said no. That was some time this spring. I think they were paying about seven and a half cents, and elsewhere they usually got nine and nine and a half and did not work any harder."

He told me one afternoon, when we were speaking about the cattle and the sale last fall, that there was a man who came up from Glengarry to purchase an animal that was advertised and he complained one day in the barn before two or three students, that the animal he had come down specially to buy was an animal that should not have been put up at the sale; that he asked the butter-maker at the dairy as to the quality of the animal and her milk, and he said that they could not recover her butter fat except with a separator. Mr. Story said they put up that animal for sale and sold her as a milking cow.

During the dairy course, Mr. Story came over to where some third year students were working. A short time before some cream had been taken from the creamery and one of the students mentioned it. Story said that if it had been any other students than the ones who took it, there would have been quite a row about it. He said the engineer had reported it to the President, and that because they were special favorites of the President, nothing was said about it."

Mr. STORY gave the following evidence:

A. Are you in the habit of retailing stories to Prof. Shaw from time to time?
A. Yes, I did not keep anything from him.

Q. Well knowing that the result was to create a harsh feeling between him and the others?

A. I did not think that.

Q. Reads extract from diary, dated December 11.

On November 30 you saw something in the Bursar's office about the dairy accounts which you repeated to the Professor as follows: "Nov. 30th. 1892—Mr. J. E. Story tells me to-day that in the Bursar's office he was shown a letter by the Bursar from the Provincial Auditor, Mr. Sproule, to the effect that the dairy accounts had been returned to the amount of 700 odd dollars, which had been expended in excess of the appropriation."

Q. Do you remember a conversation you had with a gentleman in Montreal?

A. Yes, with McMillam—I thought it was my duty to tell him that.

Q. "June 5th, 1893.—John McMillan, M.P., of Consance, in conversation with with Johnston E. Story, the farm foreman, at Montreal, in the Exchange Hotel, (Point St. Charles), Montreal used the following language: God., Story, Prof. Shaw has been at the bottom of other things and it leads me to believe that he has been at the bottom of this present riot." He (Mr. McMillan) referred to the charges which the Opposition were urging in Parliament in Toronto over the College and things appertaining theroto. He also said, when speaking of the roads made about the College, that "He believed he (Mr. McMillan) could make the roads with less labor. The above conversation with Mr. McMillan took place on May 9th, 1893, and was told to me on the date which introduces this paragraph." Did you tell him for the sake of harmony?

A. No, just so that he should know what McMillan thought about him.

Q. Then you also show your wife's letters to Prof. Shaw?

A. Yes, I told Prof. Shaw that Mr. Dyer was displeased about the seed peas he got from us. (Reads extract.)

Q. Had you a conversation with Prof. Shuttleworth about the two men having failed which you repeated to Prof. Shaw. (Reads extract): " June 10th, 1893—The public press stated to-day that H. Story, S. Curzon and E. Eaton had failed in their examination in drawing and would be required to take supplementaries, and that J. A. S. Burns had failed in his examination in Latin." The same evening Prof. Shuttleworth, in talking of the results of the examination with Mr. Story, the farm foreman, said that "It always reflected on the teacher when students failed." This remark seemed a little strange when taken in connection with the fact that 3 of the 4 who failed did so in the subject of drawing—a subject taught by Mr. Sharman, one of the ablest teachers at the College, but one who was known to be in sympathy with the boys who were lifting up their heads against hydra-headed oppression?

A. Yes.

On June 12 you reported a conversation which you overheard between the President and Mr. McCallum. (Reads): "June 12th, 1893—Mr. J. A. B. Sleightholm, B.S.A., of Humber, visited the College May 24th. He met the Bursar at the door of the College and talked with him for a short time. The President, who had been lingering around the door then took the Bursar severely to task as to the purport of the conversation; and more than insinuated to the Bursar that the conversation had been about him (the President). The President added, moreover, that he could not see how it was the graduates were always talking against him. This information was conveyed to me by Mr. Story, the foreman, on the date mentioned above. The Bursar was his informant."

A. That is wrong; I did not stand listening; the Bursar told me.

Q. This was all done for the purpose of harmony?

A. It was not with the intention of creating want of harmony.

FINDINGS OF COMMISSIONERS.

With reference to the charge of lack of harmony on the part of Dr. Mills, the principal evidence respecting the harmony of the staff and officers of the College prior to 1888 was given by the late assistant resident master, Mr. E. L. Hunt. He stated that the following officers were dismissed or resigned in consequence of a lack of harmony between them and the President of the College, Dr. Mills, namely, Professors Brown, McMurrich, Robertson, himself, Bursar Deacon, Farm Foreman Woods, and Matrons Mrs. Speight, Miss Dunn and Mrs. Martin.

The Commissioners regret to be compelled to report that Mr. Hunt gave his evidence in a most unsatisfactory manner, apparently with one object in view namely, to injure the President, towards whom he admitted having very bitter, feelings. His evidence at times was conflicting and contradictory on important matters.

It was apparent from his own and other evidence given upon the subject that he had been influenced against the President by Mrs. Martin when matron, and that this feeling became intensified upon the dismissal of Mrs. Martin.

He has apparently been doing all in his power to poison the minds of one or two of the officers and several of the ex-students against the President, and was one of the chief agitators for this investigation.

Upon the evidence of Dr. Mills, Prof. Robertson and others, your Commissioners are of opinion that Mr. Hunt was entirely mistaken as to the relations of Dr. Mills and the officers named, other than Mrs. Speight, whose removal at the President's request was justifiable.

With reference to the lack of harmony alleged to have been caused by President Mills towards Prof. Shaw, your Commissioners are of opinion that the evidence establishes that wherever lack of harmony existed it was at first caused by Prof. Shaw's actions towards the President, in (among other things) talking against the ability of the President to outsiders, as shown by the letter written to him by Hon. Charles Drury, then Minister of Agriculture, a few months after his appointment, and his continued refusal to acknowledge the authority of the President.

The cause of the lack of harmony was, in the opinion of your Commissioners, not attributable to Dr. Mills, but to Prof. Shaw.

With respect to the conduct of Dr. Mills, it appears that Mr Hunt stated to Sharman and others that he was an untruthful man, and that this statement was accepted by them and was their only evidence in support of the charge that the

President was a false man. Three of the ex-students, namely, Buchanan, Brodie and Sleightholm, stated that the reason they objected to the President was that he had found fault with them while in the College, having on one or two occasions called them names they considered improper.

Prof. Robertson, in his evidence, stated that he had found fault with the President in consequence of some matters of discipline, and the dismissal of Mrs. Martin. It was evident that Prof. Robertson had not known all the circumstances connected with the different matters complained of by him at the time he felt aggrieved. He spoke highly of the President in his position at the College, and considered that he was doing good work ; and that he personally did not leave through any lack of harmony with the President, and that he never found it impracticable to get his work well done.

Prof. Shaw stated in his evidence that Dr. Mills was an untrue man, but gave no instance of untruthfulness in support of this general charge.

Two or three of the present students, and Mr. H. B. Sharman, the assistant chemist, gave evidence that the President was false and alleged in support of that statement that the President had stated to the two gentlemen making inquiry into the late trouble against Mr. McCrae, the assistant resident master, that he did not know the minds of the third year students in that regard. This statement of the President's was undoubtedly true, for we find that in the evidence of Mr. Ferguson he gave the circumstances of the third year students agreeing to go before the President and state their feelings on the matter, but when they went before him, they declined to do so, and Prof. Shaw found fault with them for their action.

Another occasion stated by these students and Mr. Sharman showing the President to be "false," was in reading a telegram to the students from the Minister of Agriculture respecting their attendance at lectures prior to the investigation into the McCrae trouble. The telegram and papers respecting that matter bear out the President's statement that he read only what had been sent to him, and that the students and Sharman were mistaken.

Mr. John I. Hobson, Chairman of the Advisory Board in connection with the College, spoke in the highest terms of the President's character.

In our opinion the attempt thus made to defame and damage the good name of the President has utterly failed.

We are of opinion that the President has on certain occasions acted harshly in speaking to students, and possibly to some members of the staff, but the circumstances under which he did so evidently required stern discipline.

With reference to the instances of lack of harmony given by Prof. Shaw, first, those against the President, and second, those against the Minister of Agriculture, the evidence fully establishes the fact that Prof. Shaw had no ground

for complaint whatever. The instances given were most trivial in their nature, and had evidently been previously made use of by him for the purpose of poisoning the minds of the students against the President and the Minister of Agriculture.

Your Commissioners find the evidence establishes that the President was justified in all his actions in the instances referred by Prof. Shaw, and that they were of a most trivial nature. We fail to understand how any gentleman of intelligence could look upon such matters as instances of lack of harmony on the part of the head of the institution, whose duty it was to keep an oversight of all matters connected with the outside and inside departments.

We are of opinion that the real difficulty with Prof. Shaw was his desire to obtain full control of the agricultural department, without responsibility to the Minister, the President or any other officer He persistently refused to be guided by the President, or to submit in any way to his authority from the day of his appointment up to the present time. The President acted within his authority given him in the by-laws in the instances mentioned.

In connection with the action of Dr. Mills in many of the instances above referred to your Commissioners find that he was remiss in not upholding his authority over the agricultural department on all such occasions. Had he done so, we are of opinion that much of the present difficulty would never have arisen.

With reference to the instances of lack of harmony with the Minister given by Prof. Shaw, your Commissioners are of opinion that the evidence proves that Prof. Shaw was desirous of evading all responsibility to the Minister of the day. The letters written first by Hon. Charles Drury, and subsequently by Hon. John Dryden, fully prove the difficulties they had to contend with through the actions of Prof. Shaw. His replies thereto were in several instances most impertinent.

With reference to Barnett, the herdsman, while we are of opinion that the herdsman acted improperly, at least on one occasion, namely, with reference to the sheep pen, and that he expressed himself toward Prof. Shaw in a manner that was unbecoming, we find that it was the duty of Prof. Shaw, having charge of that department, to give such instructions to the herdsman as would enable him to attend to his duties efficiently. This Prof. Shaw admittedly declined to do. He blames Barnett for over-feeding, but is unable to give any instance in which that was done. He, on the other hand, neglected to make enquiry into the quantity of feed supplied to the stock by Barnett from time to time, and also refused to give detailed instructions as to the manner of feeding. He admitted that he seldom visited the stables to ascertain what was being fed, or the manner of feeding, or how the cattle, sheep and pigs were being taken care

of. He appeared to judge that Barnett was over-feeding from the fact that the cattle were too fat and were unprolific, and that the cost of feeding was much larger than formerly.

It is no doubt true that the cattle have been kept in high condition, but, as stated by Dr. Grenside and Mr. Hobson, that was absolutely necessary for educational purposes, and especially necessary considering the position of the institution to the public, and the liability to adverse criticism in case they were not found in proper condition.

We are of opinion that Prof. Shaw, in connection with Mr. Story, the Farm Foreman, early took a dislike to Barnett, because, without reasons, they considered him to be a friend of the Minister of Agriculture, and believed him, as Prof. Shaw states in his evidence, to be kept there by the Minister as a spy. There was no evidence whatever to show that Prof. Shaw's belief had any foundation in fact. On the contrary, it was shown conclusively that Barnett received no instructions whatever from the Minister, nor was he there for the purpose of informing the Minister of any acts of Prof. Shaw or of any other officer in connection with the institution, but was retained by the Minister solely on the ground of his qualities as a herdsman and feeder of stock. These qualities are fully upheld by the evidence of Dr. Grenside, Veterinary Surgeon to the institution for eleven years, and by Mr. Hobson, Chairman of the Advisory Board since its inception.

We are of opinion that Prof. Shaw attempted to interfere with Barnett by endeavoring to impose upon him as his assistant an old man, who had acted previously as helper, and had proved himself utterly unfit for succeeding in consequence of his fear of the bulls. These facts were stated by Barnett to Prof. Shaw, and notwithstanding such knowledge the Professor desired to compel Barnett to accept him. Barnett was subsequently upheld in his actions in this matter by the Advisory Board.

With respect to finding fault with the Minister for purchasing stock in the Old Country on account of the expenditure, it appears that Prof. Shaw was aware of the stock being purchased. It appears that the Minister obtained an increased grant to cover the over-expenditure on account of such purchase, as shown in the Public Accounts for the year 1891, page x.

With reference to his difficulties about the bulletins, we consider that instead of finding fault, Prof. Shaw should have been grateful to the Minister and his Deputy for correcting the many mistakes therein, which, had they been published in the form presented by Prof. Shaw, must have been ridiculed by the public generally.

Respecting the assistance for work in his office, your Commissioners are of opinion that, while doing as much work as an ordinary editor (for which he received at least $900 a year in addition to his annual salary from the Govern-

ment, and without the knowledge of the Minister or members of the Government, or the President of the College), it ill became Prof. Shaw to complain of over-work in the performance of his official duties under the circumstances. When the Minister of Agriculture proposed to relieve him from the experimental department in order to give him more time for his remaining duties, he found fault with the Minister for even proposing it, and accused the Minister of insulting him by such proposition.

As to the complaint that he did not have an opportunity of purchasing stock in time for experimental work in one instance, the evidence produced by himself was that he wrote to the Minister for money on October 19, 1892, and his wishes were at once complied with, as soon as he accepted the conditions proposed by the Minister on which the stock should be purchased.

As to charging Prof. Shaw with being responsible for large over-expenditure, the evidence fully establishes that ever since his appointment the expenditure in his special department has exceeded the estimates.

Your Commissioners would respectfully refer to the record book kept by Prof. Shaw, in which he entered all matters that would have a bearing against the Minister, President and other officers of the institution in case an investigation should be held. This book is dated 28th October, 1889.

As to the conduct of Prof. Shaw, your Commissioners cannot condemn him too severely. We are of opinion that he has systematically poisoned the minds of students from the date of assuming his duties up to the time of this investigation against the President of the College and the Minister for the time being His opportunities for so doing were facilitated, as he himself stated, by his working with the students in the fields and on the roads.

Prof. Shaw was warned by Minister Drury of the dangerous results of such conduct shortly after his appointment. It was pointed out to him by the Hon. Mr. Drury in a letter, dated December 13, 1889, that "nothing can be more destructive to the harmonious working of an institution than for any officer to fall into the habit of explaining to students that he desired to pursue a certain course, but was prevented from so doing because some one in authority did not concur with his views."

He won the confidence of the students in many ways, some by giving them employment at the expense of the Government as drivers, others by showing an interest in their welfare, and then mentioning his grievances, giving them to understand that he was a much abused man, and that he was unable to do for them and the farm as much as he would like because his powers were being curtailed by the Minister and the President, who were oppressing and hampering him in the way above indicated.

He has in this way shown a very marked and deplorable want of loyalty towards the Minister and the President as well as towards the institution, and has done much to bring about the present feeling of dissatisfaction and unrest among the students and ex-students, he invariably making them believe that he was a victim and the Minister and the President his oppressors.

Your Commissioners have set forth in this regard certain facts that were proven against Prof. Shaw: first, the purchase of his own cattle after his appointment in the name of his servant, and without the knowledge or consent of the Minister or the President, and in direct violation of the by-laws of the institution.

We also find that he was guilty of gross neglect in not keeping a proper account of travelling expenses during the month of January, 1893, whilst on a tour in connection with Farmers' Institute meetings. We are of opinion that he received the sum of at least thirty dollars over and above the actual expenses incurred and paid out by him for the delegation during this tour. His explanations as to the discrepancy in the accounts were most unsatisfactory, and fail to account for the overcharges. The manner of rendering the account was well known to himself, and there were columns for putting down the items that he claimed to have paid out, but he neglected or ignored the same. He kept the account, according to his own evidence, carelessly on slips of paper which he afterwards destroyed. His evidence on this subject was contradictory in many respects, and although six months had not elapsed from the date of expenditure to the time of giving his evidence, and all that expenditure made within fifteen working days, he stated that he could not remember how the sum of forty dollars over-expended was incurred other than by a general statement that he had paid out all he had charged.

Your Commissioners opened the investigation in Toronto, on June 14, 1893, in consequence of a number of the students being there attending to receive their degrees prior to their departure for home. This was done for the purpose of obtaining their evidence, and also saving expense and delay in bringing them before the Commission from their various homes. After examining such students and two or three others who attended on June 14 and 15, your Commissioners adjourned to the College, and continued the examination of witnesses on June 16. Prior to commencing such examination at the College, your Commissioners publicly referred to the examinations in Toronto and the reasons for holding same. Prof. Shaw was present when such announcement was made. His son was examined in Toronto and was present during the examination of nearly all the other witnesses there, and from remarks made by Prof. Shaw during the investigation, it was evident that he was aware of the nature of the evidence so given. At the close of the investigation Prof. Shaw handed in a letter to

your Commissioners, in which he protested against the action of your Commissioners in taking the evidence in Toronto without his knowledge, in the presence of Dr. Mills. Your Commissioners informed Prof. Shaw that the investigation was a public one, that they allowed the public to be present, refused admission to no one; that Dr. Mills came in after the first witness had been examined; that there were no charges made against Prof. Shaw or any other officer. Prof. Shaw was then asked if he had been prevented from calling any evidence by your Commissioners, or if he had any further evidence to give before the Commission closed, to which he answered: "No, sir."

Your Commissioners beg to state that Prof. Shaw was represented during the greater part of the investigation by able counsel; no other officer asked the same privilege; and that your Commissioners sent for such witnesses as he required, the expenses of same being borne by the Government.

With reference to H. B. Sharman, the Assistant Chemist, we find that he had unduly interested himself in connection with the student movement against the Assistant Resident Master, Mr. McCrae. It appears that he consulted with them from time to time, and apparently encouraged them in their actions. He also alleged in the presence of students that the President was an untruthful man. He informed Prof. Shuttleworth that the president was a liar. He obtained from one of the students a register containing the names and addresses of ex-students, and without the knowledge or consent of the President, forwarded it to Mr. Morgan, of Strathroy, an ex-student, for the purpose of helping him to communicate with the ex-students to enlist their sympathies in the agitation for an investigation of the College, He stated to at least two of the students that they should keep the matter quiet and not inform the President of what he had done.

His acts in connection with both matters were, in the opinion of your Commissioners, such as would lead to disloyalty among the students and influence them to dishonorable acts, especially as it was shown by one of the students that he advised them to recommend a student being called on behalf of Mr. McCrae during the investigation into that trouble, believing, as he stated, that such student would give evidence detrimental to Mr. McCrae.

With respect to Mr. Johnston E. Story, the Farm Foreman, your Commissioners are of opinion that he has been active, in connection with Prof. Shaw, for some years in poisoning the minds of students against the Minister and the President. He reported every little circumstance that came to his knowledge to Prof. Shaw that he considered would occasion discord between Prof. Shaw and the Minister, the President or any officer of the institution.

We are also of opinion that he has not, as farm foreman, attended to his duties in looking after student labor and the regular farm labor as required of him, and that the large expenditure for labor has been largely owing to his laxity in overseeing his work.

Your Commissioners are of opinion that it is a great mistake to require him to travel throughout the country purchasing stock, and thus neglecting his legitimate duties as farm foreman.

Your Commissioners beg respectfully to report that the petition presented by the ex-students calling for this investigation, was so presented by friends of Prof. Shaw, asking for the appointment of four Commissioners, three of whom they knew to be opposed to Dr. Mills, the President of the College, and evidently with the intention of having Dr. Mills removed from his position as President. The evidence given by them shows how greatly mistaken they were in the grounds for seeking the investigation.

In conclusion, your Commissioners regret to be compelled to report that the manner in which some of the students gave their evidence indicated that they were not desirous of giving all the information within their knowledge. In this connection we would mention the name of Mr. W. M. Newman, who we believe evaded the questions in a very dishonest manner, and we would also report that his actions among the other students are deserving of the highest condemnation.

This investigation has clearly proved to your Commissioners that it is in the interest of the institution that the rules, regulations and by-laws in connection with the institution should be rigidly enforced; that it is absolutely necessary that there should be only one head to the institution, and he alone responsible to the Minister for the proper discharge of the duties of all the staff and officers connected therewith, and that the College by-laws are sufficiently strict and definite if properly enforced.

We have the honor to forward herewith the evidence taken during the investigation, together with all documents referred to therein.

We have the honor to be,

Your most obedient servants,

JOHN WINCHESTER (Chairman).
JOHN WATTERWORTH,
J. S. PEARCE,
Commissioners.

Toronto, July 20, 1893.

ANNUAL REPORTS

OF THE

DAIRYMEN'S AND CREAMERIES'

ASSOCIATIONS

OF THE

PROVINCE OF ONTARIO

1893.

DAIRYMEN'S ASSOCIATION OF EASTERN ONTARIO.
DAIRYMEN'S ASSOCIATION OF WESTERN ONTARIO.
CREAMERIES' ASSOCIATION OF ONTARIO.

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1894.

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DAIRYMEN'S ASSOCIATION OF EASTERN ONTARIO.

OFFICERS FOR 1894.

President, - - - - - - T. B. Carlaw, Warkworth.
1st Vice-President, - - - - - John McTavish, Vancamp.
2nd Vice-President, - - - - E. J. Madden, Newburg.

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Division No. 1. . . . . Edward Kidd, North Gower.
Division No. 2. . . . . Wm. Eager, Morrisburg.
Division No. 3. . . . . Richard G. Murphy, Elgin.
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Division No. 6. . . . . Henry Wade, Toronto.

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Treasurer, - - - - - - P. R. Daly, Foxboro'.
Auditors, - - - - Morden Bird, Stirling.
J. R. Dargavel, Elgin.

LIST OF MEMBERS

FOR 1894.

Name.	Post Office.	Name.	Post Office.
Abbott, R. C.	Lakefield.	Ferguson, Wm. H.	Inverary.
Ashley, Harford	Belleville.	Fargy, Peter	W. Huntingdon.
Anderson, W.	Peterborough.	Fargy, John H	Roslin.
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Bensley, Wm	Warkworth.	Flavell, J. D.	Lindsay.
Bensley, G. H.	"		
Brintnell, E. P.	Belleville.	Grant, Alex. W.	Montreal.
Brown, T. K.	Fleetwood.	Grant, J. S.	Lakefield.
Bickle, S	Peterborough.	Grant, W W.	"
Bissell, Wm.	Algonquin	Garbutt, H. C.	"
Burnie, M.	Spencerville.	Galvin, G. J.	"
Bailey, A.	Campbellford.		
		Herald	Campbellford.
Campbell, A.	Ormond.	Hodgson, H. A.	Montreal.
Crosby, John	Campbellford.	Honey, J. G.	Orono.
Carlaw, T. B.	Warkworth.	Hope, Richard	Lang.
Casement, W.	Lakefield.	Haggarty C.	Godolphin.
Cluxton, Wm.	Peterborough.	Harrity, John	Warkworth.
Clullick, John I	"		
Cook, Wm.	Belleville.	Imperial Produce Co.	Toronto.
Calder, Chas. A	"	*Intelligencer*	Belleville.
Coughlin, John	Hastings.		
Carnegie, J. H.	Coboconk.	Jackman, Geo.	Stoco.
Courier	Perth.	Jose, Geo.	Halloway.
		Jameson, S. J.	Mt. Pleasant.
Daly, P. R.	Foxboro'	*Journal*	Warkworth.
Douglas, John	Warkworth.	*Journal*	Prescott.
Derbyshire, D.	Brockville.		
Drummond, J. M.	Keene.	Kerr, J. H.	Moira.
Dillon, Thos.	Ex. Farm, Ottawa.	Keeler, Jas	Campbellford.
Dawson, Frank	South Lake.	Kidd, E.	North Gower.
Evans, R.	Yelverton.	Leizert, J. T.	Pittston.
Edwards, S.	Warsaw.	Lytle, J.	Franklin.
Ewing, D.	Cobourg.	Lowry, W. H.	Peterborough.
Eager, Wm.	Morrisburg.	Liddle, Robt.	Lakefield.
Eager, Geo.	Kemptville.	Lane, Jas.	Dufferin.

List of Members.—*Continued.*

Name.	Post Office.	Name.	Post Office.
Lane, John	Big Springs.	Raymer, Ira S	Box Grove.
Lackie, D	Peterborough.	Roy, S. J	W. Huntingdon.
		Rollins, Robt	Madoc.
Moore, W. A	Perth.	Robertson, W. W	Lakefield.
Miller, W. H	Box Grove.	Rushnell, Adam	Halloway.
Murphy, R. G	Elgin.	Riddle, J.	Bensford.
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Moore, Jas	Hastings.	Robertson, Thos	Dunsford.
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Morgan, A. P.	Peterborough.	Stewart, Geo	Peterborough.
Moore, C. D.	"	Smith, H.	Warsaw.
Maloney, John	"	Spence, H.	Norwood.
Middleton, Jas.	"	Sanderson, M. E.	Selwyn.
Mann, Ernest	"	Soper, H. M.	S Mountain.
Moreland, John	Sydenham.	Smith, C. F.	Belleville.
Madden, E. J.	Newburg.		
Moore, J. R.	Ottawa.	Thompson, Thos	Springbrook.
Matchett, S.	Peterborough.	Thurston, Wm.	Bobcaygeon.
Moore, J. W.	"		
McTavish, John	Vancamp.	Valleau, J. W.	Keene.
McGee, Geo	Stirling.		
McConnell, H	Springbrook.	*Watchman*	Lindsay.
McComb, S. S	"	Whitton, Jas	Wellman'sCorners
McEwen, J. B.	Bridgenorth.	Ward, Robt	Wallbridge.
McAlpin, Henry	South Lake.	Weir, W.	Lang.
		Wood, J. A.	Fleetwood.
Nelson, Nassau	Lakefield.	Warham, R.	Peterborough.
		Wade, Hy	Toronto.
O'Brine, T.	Brunswick.	Warrington, J. T., jr.	Belleville.
Overend, Wm.	Peterborough.	Wilson, Wm	Apsley.
Ontario	Belleville.		
		Young, A.	Peterborough.
Purvis, A. P.	Maxville.		
Publow, G. G.	Perth.	Zufelt, S. A.	Chesterville.
Payne, S. R.	Warsaw.		
Parks, R. S.	Manchester.		

SEVENTEENTH ANNUAL CONVENTION

OF THE

DAIRYMEN'S ASSOCIATION OF EASTERN ONTARIO.

The seventeenth annual meeting of the Association opened in the Opera House, Peterborough, on the morning of Wednesday, January 3rd, and adjourned at 4.30 p.m., on the following day. Three sessions were held on Wednesday and two on Thursday, all of which were well attended. Several ladies were among the audience at every sitting.

THE PRESIDENT'S ADDRESS.

Mr. Wm. Bissell, of Algonquin, President of the Association, opened the proceedings at 10.30 a.m. on Wednesday, by calling the meeting to order and delivering the following address :

It gives me great pleasure, ladies and gentlemen, to meet the dairymen of Eastern Ontario once more, especially after the very successful season just closed. Never in our history have we done so well. These grand results have been accomplished by your hearty co-operation in the good work done by the instructors under our direction. All will agree that the quality of our goods has been finer in 1893 than ever before. I never felt prouder of Ontario than when I saw our cheese at Chicago this fall, and had the opportunity of comparing them with American cheese. We had a splendid exhibit there which was a great credit to us and to our country, and I am sure the success we attained there will help us for years to come.

We are convened for a practical purpose--the diffusing of better dairy knowledge among our farmers and manufacturers. We have made advancement each year ; not only in the quantity but more especially in the quality, and I trust that in 1894 we will make more advancement than any previous year. I take this opportunity of thanking the officers and members of this Association for their valuable assistance, especially in responding so generously to our call to make a large exhibit at the World's Columbian Exposition We want to stir up our farmers so that they will do as well as the best are now doing, producing larger quantities of milk from the same number of cows, and cheapening the cost of production. The selection and care of better cows, the building of silos, paying for milk according to value, and various other subjects of great importance will be brought before you and I trust that you will all enter heartily into the work of making this a grand meeting.

We have had a healthful influence in bettering the condition of our country in the past and still greater possibilities are before us. We want more members, and I trust that every dairyman will join this Association and assist an institution which has done more than any other for the upbuilding of our dairy industry.

The Hon. Mr. Dryden, Minister of Agriculture, has given us a every possible assistance, and by continuing the grant has enabled us to carry on the work vigorously. We are specially thankful to him for establishing a Dairy School at Guelph in connection with the Agricultural College where the proper training of our cheese-makers can be done in winter, thus enabling them to do better and more intelligent work. Nothing has been done of more importance to our dairymen than the establishment of this Dairy School where the best possible training is available to all.

Prof. Robertson, Dominion Dairy Commissioner, has been active in aiding us in connection with the World's Fair. In short, I cannot see where we could have improved our management of this very important branch of agriculture.

I now leave the Convention in your hands after recommending the following standing Committees, which I trust, will meet with your approval.

COMMITTEES.

Business.—J. T. Warrington, Belleville; T. B. Carlaw, Warkworth; D. Derbyshire, Brockville.

Nominations.—Henry Wade, Toronto; James Whitton, Wellman's Corners; Edward Kidd, North Gower.

Dairy Utensils.—J. B. McEwen, Toronto; G. G. Publow, Perth; Robert Rollins, Belleville; A. P. Purvis, Maxville.

Finance.—Henry Wade, Toronto; John McTavish, Vancamp; R. G. Murphy, Elgin.

Legislation.—Wm. Eager, ex-President, Morrisburg; J. T. Warrington, Belleville; Wm. Duff, Inverary.

A YEAR OF VICTORY AND PROGRESS.

Mr. D Derbyshire, of Brockville, was then called upon, and spoke as follows: It gave me much satisfaction to listen to the excellent address just delivered. All will agree with the President that never was better work done for the dairy than during the past year, and never has the cheese been of so fine a quality. Everyone who had the opportunity of seeing our magnificent cheese exhibit at Chicago must feel proud that he belongs to the grand Dominion of Canada. As dairymen of Ontario, we cannot but feel proud that ninety-five per cent. of the prizes for fancy cheese at the World's Fair was taken by Canadians, and largely by the makers of our own great Province. (Applause.) Had the matter been taken a little more fully in hand we could easily have taken all. No other cheese exhibited had the style or get-up of the Canadian article. The position we there attained is an enviable one, and the cheese world is watching what we are going to do further. Greater activity is already taking place in cheese circles on the other side of the line. I recently a tended a meeting of the Watertown Cheese Board, and they are even now endeavoring to occupy the place we took at Chicago.

The cheese industry, I think you will all agree with me in saying, is a natural industry of this country. No other business, rural or urban, has gone forward like it. No article has come to the front among the industries of Canada like the manufacture of cheese. Now, if the country is naturally adapted to this occupation of cheese-making, what is the duty of dairymen? Is it not to put more energy into it; to disseminate more knowledge among agriculturists; and to show farmers generally that it is their privilege and their mission to keep a better cow, and to handle her in a better way? ore money has been received by the farmers of Ontario through dairying than from

any other source. And as this is our leading industry, is it not to our advantage to meet to-day. as we have done, to talk over matters, to spread knowledge abroad, and to put more activity into the work of the manufacture of milk into saleable articles of butter and cheese? We aim to instruct you so that you may get milk of better quality and in larger quantity than is commonly done, and to help you to put the cheese business in a more prosperous condition by advancing the quality and output of our goods even beyond the high point at present reached We have men in our section who are getting $60 per cow for the milk they send to the factory, while near them, and patronizing the same factory, is a man who gets but $18 a cow. The first man is a progressive dairyman, and is up to the teachings given at this and similar gatherings; the other man is one who, in talking over dairy matters with me on one occasion, said: "Oh, dang the cow, anyway." (Laughter and applause) If we could get all the dairymen of Canada to send $60 worth of milk per cow to the cheese factories, it would mean double the amount of milk in the vat, and double the amount of money in the pockets of the dairymen. We should not encourage the building of small factories, but see that the milk is manipulated in large establishments. There are too many small factories crowding each other, where a less number with larger and better equipment is needed. We must also see to it that the best skill is employed, for skill and intelligence must enter into the manufacture of a first-class article of cheese—skill in producing milk, skill in getting milk to the factory in good condition, skill in handling it when being turned into the finished article, and skill in placing it in the market. (Applause.) It is important that the goods should go on the market regularly and in the very best possible condition, if the reputation of the factory is to be made and sustained. In this way your cheese will arrive in the old country in better condition, and you will thus be able to hold your customers there. I wish to repeat and emphasize the importance of regular shipments. Some salesmen are rather inclined to turn speculators, and hold their cheese back for a week or two, in the hope of a rise. But even if they do get a little more in price they will lose almost as much in weight and in the prestige of their factory. Market your goods regularly.

The President has made reference to the Dairy School recently established at Guelph by the Ontario Government. I regard that institution as one of great importance to the country. There is no dairy school on the continent to-day better equipped for educating and assisting agriculturists in the science and art of dairying than that establishment at Guelph. They have all the apparatus complete; the best machines are used; the newest and most approved methods are practised, and the tuition is up to date. I desire to draw your attention to another point. The tendency of too many of our young makers is to offer to run a factory a little cheaper than the man who is now making, and who perhaps has been a successful maker. I would implore owners and patrons present to stand by the man who knows the people, who knows the milk, who knows the apparatus and does good work, and do not give him up just because some new man is willing to work for a little less. (Applause) Do not change your cheese-maker too frequently. Pay him well for his work, and that will enable him to qualify himself for still better work. A good cheese-maker is worth a good deal to a neighborhood; he is just like a good schoolmaster. He should know the people and have a chance to visit them occasionally, and personally explain to them the aeration of milk and give them other hints regarding the getting and keeping of milk in good condition. Some makers do not do this, and their factories suffer because they are too silent. Some makers, too, are afraid to say a word to the patron who brings bad milk for fear the man will take his milk to another factory. Factorymen should stand by the maker in his endeavor to get good milk, and only good milk, for the factory. Every patron should take a pride in the good name of his factory, and if his milk is deteriorating he should be thankful to the maker for letting him know it, and then he should correct the evil. The main advance in the cheese business must take place on the farm, not in the factory, for our cheese-makers have done everything necessary to put themselves in the best condition for preparing their goods for the market. The cheese-makers are up to the times, but we need an improvement among patrons. I heard the other day of a Southern preacher who started to read a portion of scripture at a service. He was reading the account of the creation of man; then the creation of the woman, and by mistake turned over two pages

which brought him to a description of the ark, which made it appear to reader and hearers that Eve was 300 cubits long, 50 cubits wide, and 30 cubits high. The preacher paused, and said, "Dar, bredren, am anoder illustration of the wonderful women they built in dem days." (Laughter.) Now the ideal dairyman is no monstrosity or impossibility. The "wonderful" dairyman to my mind is the one who gets only $15 or $18 a cow for his milk while his neighbor gets $60 a cow. I would advise every man here to go home, milk the cows himself, weigh and test the milk, and see that the cow pays him. Weed out the bad cows and raise a heifer that will give twice as much milk as her dam or grand-dam did. You can do this by breeding and selection and weeding out. You must and can have a class of cattle that will give twice as much milk as the average cow now gives. When I saw the cows at Chicago, where the screened windows had been placed so as to keep the flies from disturbing the animals, and every effort was put forth for their quiet and comfort, I thought that if we note a little of that care with our stock it would repay us many times over. We certainly cannot expect much from the cow that has to work her own way, so to speak—to eat rye straw and get down on her knees to drink water wherever she can find it, and also keep herself warm in the winter. Take off your overcoat and go out on a cold day in winter and how much work could you do after sitting around for a while? Get the proper kind of a cow, and give the animal proper treatment and proper food and you can soon produce twice the quantity of milk that is given under ordinary methods. Hay at $8 a ton is expensive feed; two tons of silage at $1.20 a ton will produce more milk and keep the cow in better condition. Good cows, good stabling, good feed, and good treatment means good milk; and regular sales of cheese should be the aim and object of our dairymen. We have the power to accomplish all this if we will put forth the effort, and I think I can trust the energy of our dairymen to still further develop the industry so as to make it the wonder of the world.

A STRAIGHT TALK TO LOCAL DAIRYMEN.

Mr. J. T. Warrington, of Belleville, was requested to speak, and said: Having being called upon unexpectedly at this early hour of the Convention I shall not do more than offer a few words. I congratulate the dairymen of eastern Ontario at once more meeting to discuss matters pertaining to their calling, and I feel certain that our coming together will be for the benefit of each of us, and will tend to improve the quality of the cheese made in the future. Mr. Derbyshire has, in his eloquent and genial fashion, put some pratical truths before you, and has, I believe, infused newer hope and fresher enthusiasm into your hearts. While I agree with him that we have accomplished much during the year in the cheese world, and that our record has reached a point which challenges admiration, yet we have to make still further progress. The highest price of Canadian cheese in England is only 56 shillings, which is only half that of Cheshire and Cheddar. That shows there is still room for improvement. Cheese-makers must bestow more thought and attention upon the bandaging of cheese. Sometimes the bandages are only half way up. If some makers could come to Belleville and compare their cheese with neatly bandaged cheese they would be surprised, and their surprise would be increased if they knew how much more easily the neatly-bandaged article could be sold in England. Another matter demanding important attention is the boxing of cheese. Now, do not blame the boxmakers. For the money you pay you get as good a box as can possibly be made. The boxmaker gives just such an article as you pay for. Some of these cheap boxes are easily broken. If we were to send to England certain boxes we receive, from 20 to 30 per cent. would be broken before they got far from Belleville. The Ingersoll boxes are better, but they cost more than those commonly used in the east. I would also take the liberty of informing the cheese-makers of this Peterborough section that one great complaint we have against you is that you do not give 16 ounces to the pound. (Laughter). The cheese bought here are weighed, and kept over for a night or so before being sold. They are brought to Peterborough and placed on the scales;

they are put into dry boxes which absorb the moisture from the cheese, and will lose more in that 24 hours than they will in the succeeding two or three days. I do not think I ever got a sample of Peterborough cheese which made full weight in Belleville; if it did there must have been something wrong with the scales. (Laughter). In all seriousness I would say that it is only fair that the buyer should be allowed 8 ounces on the weight of the cheese. Weigh the cheese every day with the half-pound down. If your Board will make that a rule they will find it a success. Regarding the quality of our cheese you all know that we failed this year in the month which, of all others, should be the finest—the month of June. Somehow or other, in that month 75 per cent. of the make appeared to go wrong. It was very dry, the grass gave out early, and the change from grass to fodder was too quick and unexpected. The lesson then taught was taken advantage of, and soon the quality rose to above the average. The late Octobers and Novembers were really first-class; none of those puffy cheese were present, but all looked well and bored well. The usual question will be asked next spring: Shall we make white cheese or colored cheese? Peterborough is entirely a colored cheese district. In Belleville we have either all white or all colored. We must have white cheese, and we must have colored. However, you have been making good colored cheese of late in Peterborough, and you should not change. We cannot have too much colored cheese.

THE CANADIAN CHEESE TRADE A SOLID ONE.

Mr. A. W. GRANT, of Montreal, was introduced as a leading cheese exporter, and remarked: Like the previous speaker I have been called upon most unexpectedly, but as I feel greatly interested in the cheese trade I shall take the liberty of uttering a few words on the subject of the dairy industry. Canada to-day has the name of making the finest and most uniform cheese in the world, and that is saying a great deal. I do not know whether any of you have ever thought of it, but in looking over the Canadian markets you will find a most remarkable uniformity of price; there is hardly a quarter of a cent a pound between the prices in western Ontario, eastern Ontario and Quebec. Now, what does that mean? It just means that in Canada we have no skim milk cheese made. (Hear, hear). And that also means that wherever Canadian cheese is spoken of in England it stands for and signifies the best quality. In the United States they make all kinds of cheese. They have hurt their home trade demand by making skim-milk cheese. In Illinois and other western states they make about 5,000 boxes a week of larded cheese. Larded cheese, or oleomargarine, is made in this way: They extract all the butter-fat out of the milk; then they put back say a pound and a half of neutral lard, or oleomargarine, and in that way make what is to all appearance a first-class cheese, and one which only an experienced man can detect from a full cream cheese. However, I am of the opinion that in a few years the United States will not export cheese. In England a few years ago it was claimed that they made fully 5,000,000 boxes of cheese annually, which was equal to the export of Canada and the United States put together; but they do not now make that much in England, if indeed they ever did. The population of the mother country is increasing, and the area is limited; and as the population increases the large towns require more milk and a greater quantity of fresh butter. In this way the make of cheese has not kept up to the increase in population. In the United States, also, the make of cheese is not keeping up in proportion to the increase in the population, and if we had free trade we could send in a good deal of our cheese into that country.

Mr. P. R. DALY: And get their oleomargarine in return?

Mr. GRANT: No; that cheese is made up for the darkies in the South. Our superior home goods can easily hold our own market. We will have but little competition from the Antipodes in cheese. It is too far away for them to rival us in cheese-making, and they can put more value into a tub of butter which reaches the British market at a season when good butter is well appreciated. In Canada we can easily increase the quantity of

cheese without hurting the price. It was at one time feared that cheese might be over-produced in Canada, but such has not been the case, and is not likely to be the case for some time to come. One of the chief features of the cheese industry is the fact that it is a profitable business. Every other article raised on the farm of late years has come down in price—the cereals and the live stock have declined in value. The price of wheat has within a short period dropped 50 per cent. in value. There used to be a saying "As good as the wheat." That, then, meant a dollar a bushel, while now it means only half of that. The price of cheese has not altered 10 per cent. in the same time. We used to have a 13½ or 14-cent cheese for a few weeks in the spring, but the price generally has been steady of late years. In 1879 we had cheese selling at 5 and 6 cents, but prices soon recovered. Farmers now do not need to sell cheese in panicky times; they can put it in cold storage, although even that is not advisable. Mr. Derbyshire spoke wisely in warning salesmen not to be speculators and hold their cheese back. In my opinion, the two best friends of the farmer go on four legs; they are the cow and the hog. Electricity, I fear, is knocking the horse out. The governments are doing much for your business; in fact, they are almost knocking out your instructors. (Laughter). But I think the Government might go still further. I believe the cheese-maker should be compelled to take a course in the Dairy School or Agricultural College. The Government should then grant him a certificate, and that certificate should give him authority to refuse any milk; and that refusal should prevent Tom Jones or Dick Smith in any other factory from taking that milk in case due notification was given. But if that cannot be done, then let manufacturers of cheese combine and refuse any but good milk under a forfeit that will guarantee a strict attention to the agreement.

Mr. DERBYSHIRE: Mr. Grant has given us a practical address, but there is just one thing I would like to whisper to him. Our governments will never do anything in the way of coercion. They are looking too carefully after the votes of the farmers. (Hear, hear). But there should be honor enough among the manufacturers themselves, and the community generally, that they would not accept milk rejected by any other factory. That is the only way of remedying the evil.

Mr. GRANT: The farmers of this country have too much common sense, and are looking too much after the nimble sixpence to take umbrage at the governments for doing something of that kind. Sometimes the salesman will say, "Don't cut that poor fellow; he cannot stand it," and that costs me $500 or $1,000 a year. "Cutting" is not a proper name for it. It is deserving of a far worse name.

A MAKER AND BUYER SPEAKS.

Mr. JAMES WHITTON, of Wellman's Corners, was next called upon, and said: I am no platform speaker, although in private conversation I think I could give some helpful pointers, as I have had considerable experience as a cheese-maker and buyer. I have been a long time in the business, and find that much can be said on the requirements of the trade. I was much pleased with the remarks of the previous speakers. It is, indeed, true that as dairymen we must put more brain work into the business. The governments are doing their part. Winter dairying has been started in the section I come from, through the Dominion Government. Three years ago we would have thought it a great wonder if we could have raised four tons of milk a day in that district at this time of the year. Yesterday, at Wellman's Corners, we took in over four tons of milk. In the past we have been allowing the cow to idle away her time in the winter, and we have been idling away our own time, too. Last winter we commenced that dairy station. Eight cows netted me $193 profit in four months. We were told to-day that one farmer got $18 a cow out of one cheese factory, while another cleared $60, and that shows what can be done by good dairying compared with the hit or miss method. This year I tried soiling my cows. I kept ten cows after harvest on four acres of land. I fed them clover hay after June until peas and oats came in, and out of that (one acre of clover and one acre of peas and oats) fed $270 worth of milk, with only ten acres

to allow these cows to roam on. After the month of June is over the pasture is worth very little. The milk goes down suddenly; the cattle want something more succulent, as the grass gets too dry. We do not want the cow to get down on her knees to drink through a hole in the ice. We want to see her in comfortable quarters and carefully attended to. The moment you want to put an overcoat on to keep from getting chilled, that is the time to get the cow into warm quarters in the stable. (Applause.) The main thing in dairying is to keep the cow comfortable in winter. The warmer the weather in summer the better the milk. That shows the cow requires warmth. The cow is the mortgage lifter; she is the farmers' friend; therefore we must take care of her. Just as long as you as farmers and patrons of factories will insist on cutting down the price paid to your cheese-makers just so long will you get unsatisfactory results. Fifty per cent. of our cheese-makers, as soon as the cheese factories close, have not one dollar to rub against another. You should encourage your cheese-makers. Cheese-makers should post themselves more thoroughly, and, if necessary, form a union. If they are able to pass an examination, they should get a rate of pay that will enable them to live and pay an honest dollar. Any cheese-maker who will agree to run a factory of 300 cows for seven mills cannot make ends meet no matter where he comes from. Instead of this hall being full of cheese-makers to day there is not 25 per cent. present. And why? Largely because they cannot afford to come here. (Applause.) I am proud of the position the Belleville section has taken at the Columbian Exposition. Out of some thirty-eight or forty samples sent from that district this fall, with one exception, they scaled over eighty, and some up to ninety-nine points. The cheese industry of eastern Ontario is one that reflects credit upon the province in the light of that grand record at Chicago.

Mr. MURPHY: I was very much pleased to hear Mr. Whitton championing the cheese-makers. I trust that a drawer may be opened for questions from cheese-makers, and that Mr. Publow answer them at the beginning of the next session.

The PRESIDENT: I also think that more attention should be given to cheese-makers than we have bestowed upon them in the past.

WINTER DAIRYING TO THE FRONT.

Mr. H. H. DEAN, Professor of Dairying at the Ontario Agricultural College, was introduced, and after a humorous story illustrating the variety of topics touched upon by previous speakers, said: Regarding the cow I would ask, how much are we expecting from her? At a dairy gathering I recently attended I asked the men how much their cows gave them of milk and butter, and not one of them could tell me. Unless we sit down and figure it out and act accordingly, we cannot make much out of our cows. A standard should be laid down. I never heard of a standard until I went down to Wentworth. They said there that a standard was 3,000 pounds of milk. If that is all they expect from their cows they may rest assured that the cows will not go beyond it. But I would double that standard. I would place the standard at 6,000 pounds of milk in the year, or 250 pounds of butter. I cannot just now enter into the question of how this increased standard may be accomplished, but I may say that if you were to get the best cow in the county of Peterborough, and did not use her properly so far as feeding and caring for her is concerned you could not get much from her. A gentleman yesterday stated that he did not get as much from his cows as when he first started, ten years ago, but that he is making more money. When asked how that was, he said: "I am feeding my cows more cheaply and so I am making more money. Ten years ago I went into debt, $300, in improving my buildings, and building a silo. I have now paid that off and have money besides." Now that is encouraging. We need to have faith in our business, and so be willing to risk something in it. One reason why farmers do not get rich is that they do not risk enough. There must be a certain amount of risk in dairying or farming, as well as in any other business. We should have enough faith in our business to risk good stables and raise good feed for our animals. One man said yesterday that

we should grow into our business, and not merely go into it. Some people do not think it is profitable to go into winter dairying. Last year we went into winter dairying at the College. We had a difficult time of it in getting 4,000 pounds of milk daily. We had to scour the country within a radius of ten miles. We had even to send to Woodstock and Breslau, and ship into the city by rail, and this year we wanted 6,000 pounds of milk daily, but we had no trouble in getting it. We offered farmers a dollar a hundred pounds of milk last year, and many of them thought there was no money in it. A few had faith in it, however, and doubled the number of their cows for winter milk, and we have been buying their milk daily this year, and although it is cheaper than last year it is paying them well. And now their neighbors are going into it. Guelph is a poor locality for milk, because the farmers there are into beef raising principally, as they think all the money there is in the cattle business lies in turning food into beef. One of them, an Irishman, came to the dairy, and seeing the white suits the men wear, said to Mr. Bell, "May I come in, seeing I have not my wedding garment on? Last year I fed steers, but this year I want to send milk and get the whey for my pigs." In conclusion I would say that if we go into this business in a right kind of way we will get money out of it. There is more profit in the dairy business for the Canadian farmer to-day than there is in any other line of agriculture.

FIRST DAY—AFTERNOON SESSION.

Business was resumed at 1.30 p.m. The first item was the reading of the report of Instructor Publow, which was followed by the interesting discussion reported below.

REPORT OF INSTRUCTOR PUBLOW.

MR. PRESIDENT AND GENTLEMEN,—I herewith submit my fifth annual report as "Instructor and Inspector" for the "Eastern Dairymen's Association."

The district allotted to me was the same as in previous years, comprising the territory between Kingston and Ottawa west of the B. and O. Railway.

Of the 120 applications for instruction and inspection received, 60 requesting from one to three visits each, were received before the first of May. These I was able to overtake, but of the 60 received later on, only 29 were overtaken.

The factories and the number of visits each received are as follows:

McAlpin, 1; Palace, 1; Cedar Grove, 2; Lake View, 2; Fermoy, 2; Salem, 2; Ardmore, 2; New Glasgow, 3; Maple Home, 1; L.X.L., 2; Fallbrook, 1; Brookside, 3; Watson's Corners, 2; Clayton, 3; Rosebank, 2; Boyd's, 1; Mississippi, 1; Riverside, 5; Lombardy, 1; Elm Grove, 2; Willow, 1; Drummond Centre, 2; Fairfield, 1; Clear View, 2; Maberly, 1; Zealand, 1; McKenna's, 1; Singleton No. 5; 1; S.L.C., 2; Tennyson, 2; Westport, 1; Centreville, 1; Ontario, 2; North Shore, 2; Middleville, 1; Pakenham, 2; Riverview, 1; Leeds Union, 1; Chantry, 1; Harlem, 1; Plum Hollow, 1; Seeley's Bay 1; Morton, 1; Lyndhurst, 3; Newbliss, 1; Montague, 1; Farmers' Choice, 1; Oak Leaf, 1; Farmersville, 1; Elb, 1; Maple Grange, 2; White Globe No. 1, 1; White Globe No. 2, 1; White Globe, No. 3, 1; Bathurst Mutual, 1; Portland Pride, 1; Greenwood, 1; Snake River, 1; Rankin, 1; Hopetown, 1; Forfar, 1; Poland, 2; B.C.F., 1; Clear Lake, 1; Elgin Model, 1; Cold Glen, 1; Lakeview, 1; Dominion, 1; Rockdale, 1; Farmer's Friend, 1; Myers, 1; Barlow, 1; Appleton, 1; Rosedale, 1.

Of the 147 days comprising the season, 97 were spent in testing milk and giving instruction, 10 in selecting cheese for the "World's Fair," 30 in travelling between factories, 5 at milk cases and 5 detained on account of rain.

The amount of money contributed by factorymen for my services was $485—the amount from fines $140, making a total to the Association of $625.

The number of patrons fined for sending deteriorated milk was 15, and the total amount of fines imposed, $320.

$20 of the portion due the Association was remitted to two of the parties fined because of their impoverished circumstances.

This is a very unpleasant part of the business, and I strongly advise factorymen to adopt the method of paying for milk according to the percentage of butter-fat contained therein. This would not only remove the temptation to deteriorate, but would also stimulate the patrons to furnish milk of a higher standard, and the quality of our cheese would in every way be improved.

It gives me much pleasure to report on the quality of cheese made throughout the section under my charge, that it is very uniform in make, many coming very near perfection, whilst the averyge reaches the standard of fine cheese. For example: Of the 28 lots very hurriedly selected for the "World's Fair" and from the ordinary make only one scored as low as 96 points, two others 96½, and the remainder from 97½ to 99½.

As all cheese scoring 95 points were entitled to a medal, every cheese selected in my section won for the exhibitor a "World's Fair Award." I regret, however, to say that there are still some factories that would not reach this standard, but I feel satisfied that at the close of another season this number will be greatly diminished as the managers are already seeking to make needed improvements, and are inquiring for better cheese-makers.

As there will probably be some discussion on the manufacture of cheese, and as I speak at the factories of any fault I have to find, and time is limited, I have condensed this report as much as possible, but I will be pleased to give any further information regarding my work if desired.

Yours respectfully,

G. G. Publow.

Questions were invited from the audience by the chairman, in addition to the two following written enquiries through the drawer:

Question: What is the chief cause of butter-fat leaking from the cheese and what is the best way to prevent it?

Mr. Publow: I believe the chief cause of that is putting the curd to press too hot. Another cause is pressing the cheese too hard. If the curd is greasy the butter-fat keeps running out.

Question: What is the principal cause of young cheese going off in flavor, and what is the best way to remedy it?

Mr. Publow: The principal cause of young cheese going off in flavor is tainted milk. The best way is to educate your patrons to sell milk in perfect condition, and see that the surroundings of your factory, and also your utensils are perfectly clean.

Mr. J. M. Drummond: What is "off flavor?" Some buyers say that a cheese held a little long and a trifle sharp is off flavor.

Mr. Publow: I do not consider that an off-flavored cheese. A cheese off flavor is very objectionable, and will be caused by decay of some sort. A ripe cheese is not "off flavor" unless it has something objectionable in its flavor apart from its ripeness. Some cheese off flavor may improve with age.

Mr. J. C. Vann: Which is the best knife for cutting curd?

Mr. Publow: The best knife is one that cuts off uniform pieces and gives a good clean cut.

Mr. J. T. Leizert: Which is the best salt for cheese?

Mr. Publow: We use a Canadian salt. We have never found a better salt than Rice's—a Canadian brand. We have used it for eight years.

Mr. Palmer: How long would you leave the curd before pressing?

Mr. Publow: I would let it go down to 84° or 86°. I have found no difficulty in leaving it for half-an hour after salting. I would keep it up to 94° before cheddaring. Before milling I would let it cool down considerably. If you get your curd cooled down to 90° before milling you will get less butter-fat in the curd.

Mr. Horsley: What causes cheese-cracking on the surface?

Mr. Publow: One cause is pressing too cold, and another is too hard top cloths. Another cause is not using enough rennet.

Mr. T. J. Thompson: Do you not think that too much draft in the curing room may dry the rind and crack it?

Mr Publow: I have seen cheese crack in factories where there was not much draft. Leave your curd until it is properly mellow before you press it, use plenty of rennet, and you will not have many cracks in your cheese.

Mr. Horsley: Do you approve of packing curd on the rack or in the vat?

Mr. PUBLOW: I would certainly recommend the use of racks in the vat, especially in hot weather or when milk is working very fast. I have seen just as fine cheese made without racks as with them, but with racks unskilled makers can get rid of the whey better.

Mr. P. R. DALY: Would you prefer a wooden rack to the tin strainer?

Mr. PUBLOW: I prefer a wooden rack, as a tin strainer is hard on the finger nails. If you take pains in thoroughly washing the wood there is no danger from taint.

Mr. T. B. CARLAW: I would like other well-known makers and professors to be asked similar question to those propounded to Mr. Publow.

REPORT OF INSTRUCTOR ROLLINS.

PETERBORO', January 3, 1894.

I herewith submit my report as milk inspector and instructor for the season of 1893. The district to which I was appointed was the same as that of last year, comprising the counties of Frontenac, Lennox, and Addington and part of Hastings. I tested milk and gave instructions in 65 factories as follows:

Forest, 2; Glenburnie, 2; Arigan, 2; Bear Creek, 2; Battersea, 2; Duff, 2; Railton, 2; Union, 1; Keenan & Son, 2; Morning Star, 1; Thousand Islands, 1; Granite Hill 1; Moscow, 2; Rose Hill, 2; Lake Shore, 2; Harrowsmith, 2; Woodbine, 2; Gilt Edge, 1; St. Lawrence, 1; Wolfe Island, 1; Cold Springs, 1; Pine Grove, 2; Maple Leaf, 1; Woodburn, 1; Pine Hill, 2; Glenvale, 2; Verona, 2; Parham, 2; Crow Lake, 1; Tichborne, 2; Sharbot Lake, 3; Arden, 1; Oso, 2; Hartington, 2; Bell Rock, 1; Farmers' Friend, 1; Centreville, 6; Croydon, 7; Camden East, 5; Enterprise, 5; Tamworth, 2; Sheffield, 2; Whitman Creek, 2; Newburgh, 2; Deseronto, 4; Albert, 2; Moneymore, 2; Forest Mills, 3; Selby, 2; Napanee, 2; Moscow, 2; Union, 2; Empey, 2; Excelsior, 2; Marlbank, 1; Perth Road, 1; Sunbury, 1; Sand Hill, 1; Excelsior, 1; Lee Lake, 1; Central, 1; Flinton, 1; Springhill, 1; Cold Springs, 1; Jackson, 1.

I began working for the Association this year on May 15th, and continued until November 3rd.

During that time I worked for the Association 145 days; testing during 124 days, travelling and instructing 17, and attending cheese boards the other 4 days.

I tested 7,500 samples, 28 of which were tampered with. Of these 20 were skimmed and eight watered. This is a great improvement over last season in the same section.

This season one great trouble of cheese-makers in manufacturing was with gassy milk, the fault of which rests mainly with the patrons. If patrons would be particular about the water their cows drink, and immediately after milking strain and air their milk, and see that the cans are properly scoured and scalded, a great deal of this trouble would be avoided. Every patron should be as much interested in having his milk come in proper condition to the factory as the cheese-maker in the manufacture of the cheese. Good, clean, pure, sweet milk will make more cheese, and cheese that will bring a much better price in the market, and this is the desire of the patron, even more than that of the manufacturer.

Amount contributed by factorymen for my service was $438, as follows: Frontenac Board, $200; factories in Frontenac district not belonging to the Board, $20; Napanee Board, $208; factories in that district not belonging to the Board, $10.

ROBERT ROLLINS.

SCIENCE IN THE DAIRY.

Prof. H. H. DEAN then delivered the following address, the tabulated statement being shown in large figures on a sheet in full view of the audience: I did not give in any special title to the Secretary of the Association, because I was afraid that if I did so some people might get scared. Some men have a great fear of scientific names, or any mention of science in connection with agriculture or farming. Of course there are exceptions. There are some farmers who, if you were to give them a plain simple talk, without putting in some big words, would say they didn't think much of it, but just throw in a few words like tuberculosis, bacteria, etc., and they will say: "I tell you that fellow knows a heap." (Laughter) Now, every man is a theorist. Some of our theorists are men who lay no claim to scientific knowledge. What is theory? Theory is the explanation of the causes of certain facts, or a setting forth of the probable results that are likely to follow any particular line of action. Let me try to make it plain by an illustration: Take a cream separator; you see the skim-milk coming

from one spout and the cream from another. Why is that so? Why is it that the cream comes from one spout and not from the other? The scientist says that it is because when you cause a vessel to revolve at a high rate of speed if there be two bodies of different weights the heavier will be thrown in one direction and the lighter to the opposite. The skim-milk owing to its greater density, is thrown to the outside and the cream to the centre. I was talking to a man the other day and he thinks he has a new wrinkle. The skim-milk usually comes to one point in a bowl before it is delivered, and he claims that by putting down a thin sheet all the way around the inside and very close to the bowl's circumference he can skim closer than is done by ordinary methods.

We hear a good deal at the present time about gassy curd. What is the cause of gassy curd? If I were to ask every cheese maker here he would have his own reason. He might say that it is because patrons do not aerate their milk, or from some other cause. But I do not think that we know the reason. We have clean stables at Guelph, we have our milk well aerated, and yet during two or three days we had very bad gassy curds. We could not keep the curd from floating sometimes. Now, I have a theory as to why we have gassy curds. We have certain conditions which allow certain organisms or microbes to get into the milk, and these decompose the milk. If we have decomposition, whether in a log or in an egg, we have certain gases developed. If we go into a chemical laboratory we can find a gas identical with that of the bad egg, called sulphurated hydrogen. I believe there are certain organisms which get into the milk and decompose it, and thus carbonic acid gas is devolped, which makes gassy curd. We will try and get some of this gas examined by the college chemist.

Practice is the application of a theory, or the application of an accident. Take the case of corn ensilage. Some fellow thought that if he put green food in an air-tight place it would be kept from spoiling. Doubtless he was laughed at, but the practical application of that theory was the silo, which gives good green feed in the winter time. The telescope, on the other hand, is the application of an accident. A couple of children were playing one day in the workshop of a man who made glasses They happened to get two glasses in position, one behind the other, saw the wonderful effect, and called their father. He at once perceived the benefit of the discovery, and thus the telescope came about. Nearly all the advantages of the dairy are due to the applications of science. Take it in the case of obtaining cream from milk. When persons first began to get cream, they set the milk in wooden vessels and allowed the cream to rise therein. Now, just think of the condition those wooden pails and troughs must have been in after a few years! for wood, as you know, is porous. The scientist who examined this question closely, said to himself: "Tin is better." And they used shallow pans. So the scientist went on and said: "We must have deep pans," and he was laughed at, for men said that cream could not rise sufficiently in deep pails—that it could not rise more than four or five inches.

The idea was opposed by the agricultural papers, but the scientist succeeded. He was not satisfied with that improvement, and invented the cream separator. It was an upright spindle with a gear to drive it. Attached to this was a horizontal bar, and on each end of this a pail of milk was hung. It was whirled around at a high rate of speed, and when the whirling was finished it was found that the cream was on the top of the milk pails, and although centrifugal force was known long before, it was not until about 1870 that it was first used in the dairy. You know what advance has been made since that day, when they hung a couple of pails on a horizontal arm and got the cream to come in that way. But science and practice must go together. A dollar in the hand of a man who is both scientific and practical will produce more dollars than a dollar in the hand of a man who is practical only or one who is scientific only. The two attributes must be combined in order to reach success. Science does not guess at thinks merely. There are some people who can guess at things, but they cannot give an exact reason. I will try and show you the difference between knowing and guessing. The first year of the travelling dairy I said that milk would rise just as well if kept in shallow pans in a cool as if kept in a warm place. Some of the women could not agree with me, and when a woman does not agree with you she is inclined to be rather tart in her speech. As the man said

of his two wives—he married the second six months after the first one died—"My first was a Tartar; but this one is a cream of tartar." (Laughter).

During the autumn we made several trials comparing the result of creaming shallow pans at high and low temperatures, or in other words in a warm compared with a cool place. The following results show that their was less loss of fat or cream when the milk was skimmed cold than when skimmed warm.

Thirteen trials: Average temperature of skim-milk, 56°; per cent. fat in skim-milk, 0.38.

Twelve trials: Average temperature of skim-milk, 46°; per cent. fat in skim-milk, 0.28.

These trials would go to show that it is not necessary to bring the pans out of the cellar to get the cream to rise completely, but that as good or better results are obtained by keeping the milk cold. The cream is *thinner* but there is more of it.

As another illustration of the difference between knowing and guessing, I would call attention to the following experiments: The question is often asked: "If I give the cows plenty of rich feed will it make the milk rich?" Now, most men who feed cows will say "Why, certainly." But I would like to call your attention to experiments we have been carrying on for the last three years. In 1891 I took six cows and divided them into three groups, and fed them as shown in the following table:

How Food Affects the per cent. of Fat in Milk.

1891—(6 cows—3 groups).

Group.	Ration.	Average per cent. of fat.
1.	Ensilage 30 lb., oat straw 20 lb., hay 10 lb.	3.67
2.	Hay 20 lb., linseed meal 4 lb., cottonseed meal 5 lb.	3.49
3.	Hay 20 lb., peameal 4 lb., oatmeal 5 lb., cornmeal 8 lb.	3.25

1892—(6 cows—2 groups).

1.	Ensilage 50 lb., hay 5 lb., bran 1 lb.	3.61
2.	Ensilage 50 lb., hay 5 lb., peameal 5 lb., oatmeal 3 lb., barley 2 lb.	3.48

1893—(15 cows—2 groups).

Group 1 (8 cows).	Winter	3.51 (average for 1 week)
	Pasture and 1 lb. bran	3.96 (average for 3 weeks)
	Pasture, peas, wheat and bran	3.83 (average for 3 weeks)
	Pasture, green peas and oats	4.00 (average for 1 week)
Group 2 (7 cows).	Winter	3.32 (average for 1 week)
	Pasture, peas, wheat and bran	3.33 (average for 3 weeks)
	Pasture, cottonseed, linseed and bran	3.81 (average for 3 weeks)
	Pasture, cottonseed, linseed and bran	3.29 (average for 1 week)

"Slopping" Cows.

(6 cows).

	Per cent. fat.	lb. milk.
Week previous to experiment	4.29	829
1st week of experiment (14 lb. dry bran)	4.15	755
2nd week of experiment (4 lb. bran, 4 wheat—cold)	4.33	635
3rd week of experiment (4 lb. bran, 4 wheat—warm)	4.46	615

In 1892, six other cows were fed rations as shown in table, and in 1893, fifteen cows were used in the experiment.

The "slopping" of cows was also tested, with results as shown in the table.

These experiments lead to the conclusion that giving rich food to cows does not materially increase the richness of the milk. On the contrary, the animals on trial gave rather poorer milk with the meal ration. We found also that the cows did not give the same percentage of fat in the milk on two successive days. If it had any influence at all I think the 17 lb. of meal had an adverse effect, because 17 lb. of meal was more than the cows could digest, and so it reacted on their system with ill results. There was an increase of milk with the better feed, but not an increase in the percentage of fat. The per cent. of fat in the milk depends as much upon the physical condition of the animal as upon anything else. If a cow is out of condition, or gets bad treatment or neglect, the quality of the milk will decline. An injury to a cow will have more to do with the per cent. of fat than the feed will have. A cow was injured by hooking at the Farm, and her per cent. of fat at once went down.

Mr. ASHLEY : I think the good digestion of a cow turned out to pasture improves her condition and increases the per cent. of fat in her milk—certainly it increases the flow of her milk.

Prof. DEAN : There is a man with a theory, you see. Every cow has her individuality, and certain cows will give certain results upon a certain feed, while certain other cows will not give you anything like the same results. To use a well-known phrase, they are not built that way. Now, regarding slopping. I was down at Howick attending a Dairymen's Association, and a man there said that when a man slopped his cows they at once heard from Montreal. I took six cows and experimented with them. For the previous week there was 4.29 per cent. of fat in their milk. We then gave them all they would eat of slop—bran and water, etc.—and they gave only 4.15 of fat. But that is only a slight decrease. They also decreased in the volume of milk. The next week we tried another, the result being 4.33 per cent. of fat. The third week of the experiment we scalded the slop, and there was 4.46 per cent. of fat. My own conclusion is that slopping cows does not make the milk poorer in fat, while less milk was given. Slopping is therefore an expensive way to feed cows.

I would like to mention a few points touching what science has done for the patron who produces the milk. Science has enabled him to produce a better breed of cow—a cow that is specially built for the dairy. The good dairy cow of the present day is not the result of accident or luck, but is the result of scientific principles applied in the breeding of animals. Science has enabled the dairyman to feed his cow in the best way. I have already cited the case of Mr. Mason, who is making more money out of his cows now, although he gets less for their milk than formerly. Science has also enabled the patron to take better care of his milk, as it explains to him the causes of certain effects, and thus assists him in guarding against injury to a greater extent than formerly. Some persons wonder why the milk sours when it thunders. Well, the thunder is not the cause of the milk souring. But when it thunders some men will say, "That is going to make the milk sour to-morrow." Some say it is due to the electricity But scientists have worked upon this problem and say that it is not electricity, for electricity will help to keep milk sweet. Some say it is the intensified oxygen or ozone of the air, but some one went to work again and found that it was not so, as ozone had little effect on the milk. It has been found, however, that there is an organism in the air which requires certain conditions for its growth and development, and during thunderstorms there is just the conditions which will enable these organisms to grow, and that this is the cause of milk souring. A man who handles milk in Toronto said that they were keeping cream in a cold place, and were sending it out to their customers, when complaints were made that it was getting bitter and sour. I said, when the milk comes from the separator heat it to 150°, then cool it down to 50°, and see what the result will be. He did so, and found that the result was a perfect success. That is a case where the application of a scientific principle helped a dairyman who was in trouble. Last year I had complaints from persons about the milk being slimy or ropy. They sent some for examination, and we found that the cream was not out of the way.

What has science done for the cheese-maker? To go into that question fully would take too long. I might, however, indicate a little that has been done for the worker in the factory. Science enables him to get certain instruments to test the quality of his milk. Take the old pioscope or lactometer and compare them with the Babcock tester, and you will see what science has done for the dairyman. Mr. Bell, of Tavistock, our cheese instructor, has been working along the line of a "starter." When he came to Guelph last winter he was not very favorable to starters, but he found that he had to use it in order to let the boys off in time. This summer he has been using it all along. He warms the starter up to a temperature of 80° or 90°, and lets it get ripe. The following day he puts some of that into each vat, and from day to day propagates that starter in the milk in a similar way as a baker does with his yeast. Science also explains to the cheese-maker why a certain temperature is necessary in order to get the best results with rennet, and also to get the best results in the curing-room. What has science done for the butter-maker? Well, if men would only learn the composition

of milk and the composition of butter as given by scientists, and thus knew how much butter could be made from 100 pounds of milk, they would never have invested in "Black Pepsin" or this "Butter Increaser," "Butter Compound," or "Gastric Sodea." (Applause.) It is impossible for any of these compounds to increase the yield of good butter to the extent of 125 per cent. If those who have been gulled by these "fakes" had only known the simple facts that science has revealed to us regarding the component parts of milk and butter they would have been saved loss of money and much trouble and shame. I have tried most of these things myself by way of experiment. We experimented with the Black Pepsin, and could not do anything with it like what was claimed. A man came into our Dairy with Chase's Butter Increaser. I said, "Here, we will give you the use of our utensils." He came, but he could not do anything with it like he claimed. He wrote from Chicago, "If you were only here and heard Mr. Chase, you would be convinced." I extended a hearty invitation to Mr. Chase to call and see us, but so far Mr. Chase has not called. And it is so with this latest candidate, the "New Butter Process." They say they will be up to the Farm in January, but I do not think any of these processes can accomplish what is claimed or expected from them. I have been trying a new churn called the "Pneumatic." It is on the principle of forcing air through the cream. They claim that it will make more butter and better butter, and that it will keep longer. The affair looks like a huge kettle.

What will science do for the dairyman? I am satisfied that it will enable him to make better use of his bye-products. I have been corresponding with a man who says that he thinks he can take the milk sugar out of the whey at a profit, and there is a good demand for milk sugar in Europe. I also believe there is much room for development in the manufacture of condensed milk.

Mr. PEARCE: We have a condensed milk factory at Aylmer, but they find difficulty in getting a market for the product.

Prof. DEAN: In conclusion, I would say that science will enable the dairyman to make a uniform article. Some may have been trying this Lactic Ferment sent out by a firm in New York. It is hoped that by using the proper ferment in the cream they will always be able to produce first-class butter. If we could always get the right flavor in the cream and in the butter what a decided advantage it would be. I think that the line Mr. Bell is working along is a wise one. He is approaching it from a practical standpoint, and the scientist from a scientific point of view. The practical man and the scientific man should be the greatest of friends. If they continue to work together they will accomplish great things for the dairy industry.

Mr. S. R. PAYNE: Have you found an increase in the milk by feeding meal extra, on pasture?

Prof. DEAN: Up to a certain limit we have. But if the cows get plenty of pasture they do not need much meal; every man must determine how much according to circumstances. However, do not go away with the idea that it does not matter what you feed —straw or fence rails or anything. It pays to feed the cows well; but anything beyond a certain amount—the limit of the cow for profitable production—is wasted.

Mr. DRUMMOND: Is aerating milk a benefit?

Prof. DEAN: It is important and beneficial to aerate milk. Where it is aerated there is less trouble with gassy curds. But aerating will not do away with gassy curds.

Mr. S. R. PAYNE: We found that sometimes there would be gassy curd one day and none the next, and we knew that the pasture could not change as quickly as that, and concluded that it must be subject to the air to some extent.

DAIRY SCHOOL WORK, 1893.

Mr. J. B. McEwan read the following account of work done through the Dairy School during the year: In presenting to you the report of the "Dairy School Work" for the season of 1893, I can give you every assurance that the work has again been fully appreciated in every section visited, and that I am not overstating the facts when I say that the fruits of this work, together with the excellent efforts of our instructors, has caused our dairymen to manifest a keener interest at their home end of the business, thereby increasing their profits, and as a result of this increased knowledge, the delivery of the milk at the factory in better condition. The help given to the cheese-makers cannot be overvalued. Our best makers are even doing better work, our ordinary makers have been urged to take increased interest in their calling, and the makers that annually "get off" have been led back into the narrow path, much to their financial benefit and our reputation as producers of a uniform excellence of quality.

As a large number of our dairymen and makers did not fully understand the object and nature of the work undertaken last season, I spent the first few days of May in issuing and distributing the following bulletin on the work:

HINTS AND SUGGESTIONS FOR CHEESE-MAKERS.

You are all more or less familiar with the work carried on last season by the Dairy School for Eastern Ontario, a full report of which was given at the Dairymen's Convention, held in Kingston last January, and will appear in a few days in the annual report of the Dairymen's Association.

A special grant has again been made by the Ontario Government for the continuance of the work this season, and the executive are now mapping out the work, of which all will be advised in due time. The original object of the work was the establishment of a dairy school at a central point in eastern Ontario, where all cheese-makers would be invited, and even urged to attend, at least once during the season and as frequently as possible, to receive instructions on the most approved methods of manufacturing cheese during the different months of the season, the testing of milk with the "Babcock" and lactometer, and making out dividends for the payment of milk according to percentage of fat as tested by the "Babcock."

Owing to the large area to be covered it was not deemed advisable to establish the "school" at any one point, but to have it go from one central point to another, thus bringing it within reach of all.

Dairy meetings were also held to discuss the care of milk, the payment for same according to its per cent. of butter-fat for cheese making, economical and liberal feeding and specific breeding.

184 factories were visited, 244 cheese-makers met with, and 20 meetings held, at which nearly 1,500 people attended.

The plan of work this season will be along the same lines as last. A few factories centrally located and easy of access will be visited in every section, extending from Lancaster on the east, to Peterboro' and Lindsay on the west. Dates and factories visited, and meetings of patrons will be arranged by the executive or the respective cheese-boards, and due notice given.

Cheese-makers are respectfully and urgently requested to avail themselves of these opportunities. Everything is free, no charges being made.

Any factory paying for milk according to "Babcock," and desirous of help in testing, or information as to making out of dividends will receive special attention on applying to the president.

A series of one week composite tests were carried on by Prof. Shutt, chief chemist, Experimental Farm, Ottawa, with the use of bichromate of potash as a milk preservative, and the results were entirely satisfactory. A small self-sealing jar was used, and by using 0.2 gramme of bichromate of potash, the milk was kept in a liquid condition for a week. The potash, after being pulverized and measured, is put into the jar, and as each sample of milk is added the jar is well shaken, and at the end of a week a test sample is taken from the still liquid milk, and the per cent. of fat obtained is an accurate average of the six lots of milk. The results are very important to those who are, or intend, adopting this most equitable and desirable means of paying for milk at cheese factories.

Factories and Surroundings.

1. We are at the beginning of another season, and let every cheese-maker start in with but one determination and one aim in view, and that to turn out a uniformly fine quality of cheese throughout the season.

2. In these early days of May do not fail, if you have not already done so, to thoroughly cleanse the making and curing rooms and all the apparatus in use.

3. Let nothing escape your anxious eye, and cultivate a woman's hatred for filth and dirt. Subject everything in the making room, including whey spouts and tanks to a thorough scrubbing and scalding at least once a week and oftener if necessary. Fumigate the curing-room before putting cheese in, by burning sulphur mixed with alcohol. This will act as a preventative of mould.

4. If your factory is an old building don't fail to stop all leaks in the floor, and in the event of this being impossible make provision for drainage by shallow open trenches. A supply of lime and gypsum should be secured, and used on such places during the season.

5. Whitewashing making and curing rooms effects a wonderful transformation. It not only purifies and lightens them, but makes them cooler in warm weather.

Milk and the Care of It.

1. Procure a copy of the bulletin, "Milk For Cheese Factories" for each of your patrons by applying to the Dominion Dairy Commissioner, Ottawa, stating the number required, and the address to which they are to be sent.

2. Look out for bad flavors in the milk. At this season of the year you are liable to meet with "leeks" and other weedy flavors. It is folly to accept milk thus affected, unless you have time to make it up by itself for the patrons' own use.

3. Use every exertion to have the milk delivered at the factory in good condition. In your position as sole arbitrator, you have excellent opportunities of exerting good, wholesome influences. Do not be abrupt with the patrons on first offence if the milk is not quite right. In a firm but pleasant way explain the cause and remedy, because every maker can so educate his nose as to detect and explain almost any condition of the milk. If the milk is in such a condition that you cannot accept it do not hesitate to send it home. In the event of the milk being accepted as a matter of policy submit it to a dockage in weight according to its depreciated value for cheese-making. In all fairness that is due to the patrons who send good milk, which will make more cheese, and of better quality if not mixed with the tainted or gassy.

Cheese-making.

1. It is allowed that no set rules for the manufacture of cheese, from the time the milk is received until the curd is in the hoops are at all times applicable. The general fundamental principles are followed and adhered to by nearly all. The successful maker, securing at all times, under ever-changing conditions of milk and weather and requirements of the market, a fairly uniform article of excellent quality, must depend largely on judgment and skill to obtain these results.

2. The receiving of milk in good condition is a first essential, and the utmost cleanliness of surroundings and everything in connection with the manufacturing must be observed. We are led to believe that filth is a breeding ground for an unfavorable species of "bacteria," the presence of which has a deteriorating influence on quality and flavor of milk and cheese.

3. Bacteria are defined by Webster as microscopic, vegetable organisms found in putrefying organic infusions. They are very widely distributed in nature, and multiply with marvellous rapidity. Certain species are the active agents in fermentation, others are the cause of infectious diseases. To the first it is evident we are indebted for the ripening process in cream, and the curing process in cheese. The main question in these matters is to so control both as to not allow the processes to go too far. If we do we have unsaleable butter and cheese.

4. Do not over-ripen the milk. Acid develops rapidly in milk from cows for a number of weeks after the period of lactation begins. Milk in May seldom requires ripening, unless the weather is unusually cold, and even then it requires close watching.

With ordinary milk allow three hours from time of setting until ready to whey off with $\frac{1}{8}$ inch of acid; gaseous milk may be ripened with advantage to a stage allowing $2\frac{1}{2}$ hours from time of setting until ready to whey off with $\frac{1}{4}$ inch of acid.

5. Do not handle the curd roughly when tender, or cook too rapidly. Careful handling of the curd at all times will help the yield, and gradual cooking to 96 or 98° will give a firm mellow curd when ready to salt, and fat, meaty body to the cheese. Over-ripening of milk and fast cooking are apt to cause a mushy curd, and a cheese with too much moisture and a tender body.

6. Do not cheddar on the pan, especially fast working curds, if you can secure racks. They save labor and ensure better results.

7. Do not be afraid to open the windows during warm weather. Both the curd and the maker will be benefited by it

8. Do not fail to have every cheese symmetrical, and carefully bandaged before placing in the curing-room.

9. Do not neglect the cheese after moving to the curing room. Look carefully after the temperature and turn every day.

10. Do not fail to secure strong, neat boxes when shipping. Stencil the weights on the boxes carefully.

11. Do not undervalue the importance of "little things" in connection with your calling. By looking carefully after details you will meet with the most pleasing success.

As indicated in the bulletin, the plan of work was almost similar to that of last year. The only difference was, that on my last trip I did not make as many flying visits, and, therefore, the number of factories visited, and the number of cheese-makers met with, is not as large as last season.

According to the arrangements made with the President my engagement existed from the 1st of May until September 15th. I visited in all 109 factories, met with 171 makers, attended 19 meetings, at which nearly 1,100 people were present. The expenses in connection with the work were somewhat larger than last season, owing to increased travelling and the use of more liveries, which was rendered necessary owing to the way the work was arranged. The expenses were $264.04, and the balance of the grant indicates the salary.

The same ground was covered, extending from Morrisburg and Winchester on the east to Lindsay and Burketon on the west and intermediate points. In arranging the work in the respective sections, an effort was made, as far as practicable, not to hold the "school" at the same factories as visited last year. I found a decided improve-

ment in many ways over last season. The thermometers in use, were in nearly every case quite accurate. This change was effected by our firms carrying dairy supplies securing guaranteed thermometers, and the cheese-makers recognizing the importance of a trustworthy instrument did not hesitate in procuring them. A large number of the makers still take in milk that certainly should be returned, owing to its condition. Especially is this the case in some sections. I found this being indulged in to such an extent, at some factories, that the cheese were certainly of an inferior quality, and being subjected to a reduction in the price originally sold at. Not that the manufacture was faulty in a great many cases, but owing to flavors, caused by tainted and gassy milk. I wish to emphasize my advice of last year, that cheese-makers have the controlling influence on the condition of the milk received, and just to the extent that they exercise it will this evil be remedied. At our meetings we may talk "care of milk" forever, but if our makers hesitate to send milk home when it is past redemption, and deduct a certain percentage off the weight according to its depreciated value for cheese-making, when it is in a condition to be received but will not make as much cheese as well-cared-for milk will, then is there a premium on carelessness, and our talk is in vain. Again, we find in some of our factories the utmost carelessness in regard to condition, and the very clothes worn by some of our makers are suggestive of being made of cast-iron, until you come within closer contact with them, and still these very men will ask you to preach cleanliness to their patrons. Verily, the road is rough and progress slow.

The proprietors of the cheese factories should make it a part of the contract when engaging makers that everything be kept at least fairly clean, and see that it is fulfilled, instead of leaving it to the instructors to either clean up or lecture them into it. The system of taking home whey in the milk-cans has, again, had some heavy scoring against it. One large factory visited had lost nearly $400, caused by a bad flavor that developed in a few days in the cheese. I was informed that the whey remained in forty-seven cans until they were returned the following morning by the milk drawer. A number of these cans were completely spoiled for milk purposes, the sour whey having taken the tinning off the inside of the cans, leaving the iron exposed to the milk. It is impossible to keep a can in this condition clean, and prevent flavors being imparted to the milk, and certainly a maker should not be held responsible for losses caused in this way. I found a number of our makers still over-ripening the milk before adding the rennet. There was quite an improvement on this point compared with last season, but why so many continue to do it is certainly hard to understand. From over-ripened milk and too much acid in the whey—which is almost sure to follow—you usually find the cheese, soft in body, cut in color and texture, flavor not so nice, and doubtless considerable loss in handling the curd ; while, on the other hand, when setting the milk somewhat sweeter, there is time to handle the curd more gently, to cook slower, and for the curd to become nice and firm before removing the whey. This latter process usually means a better average, a fat, firm, meaty body, flinty texture, and a flavor that will be found right after months have elapsed. I am convinced more forcibly than ever that "judgment" properly applied is the weak point in many of the makers, and the prime cause of so many inferior goods at times. The belief that it is necessary to give an unusual amount of acid in the whey to ensure a close body in the cheese is erroneous. Acid can be given with advantage only to a certain limit, for as soon as the color is touched and the texture short, then is it a true indication that that limit has been passed. I found some makers being troubled by the oil starting very freely from the curd, within an hour or two from the time the whey was removed, and when it was still quite harsh in feel. It appeared to be an unnatural condition, and the cause hard to determine. After meeting with this difficulty several times, and trying different processes, I found that the most satisfactory way to handle them was to have them work off a little quicker in the whey than ordinary curds, with a little more acid than usual, mill early and salt before the oil started too freely, even if the curd was not as mellow as desirable. After repeated experiments in early milling *versus* late milling of curds at different factories, I am quite convinced that there is a decided advantage in the early milling of gassy or tainted curds, while with good curds of clean flavor there did not appear to be any material difference.

In the section covered there were ten factories paying for milk according to quality. Three in Peterboro' section—Lakefield factory, W. W. Grant, maker; Pine Grove factory, F. E. Kline, maker; Warminster factory, Stewart Payne, maker. One in Belleville section—Stirling factory, S. Denike, maker. One in Napanee section—Palace Road factory, G. W. Gerow, maker. Three in Brockville section—P. W. Strong's, Delta, Soperton and North Star factories. Two in Morrisburg section—William Eager's Chesterville factory, L. A. Zufelt, maker; and Messrs. Millar & Ferguson's Ventnor creamery. It will be seen from this statement that the number of factories that have adopted this system is small but representative, and we have every reason to hope that as a practical demonstration and trial of this system of paying for milk by "Babcock" in the several sections, the result will be a large increase in the number next season

It is doubtless a radical change from the old pooling system, but it is evident that from the time the "Babcock" is adopted it marks a strong forward educational movement among the patrons of our cheese factories. Nearly all who have studied the question are satisfied as to its workability in our factories, and that the basis of payment is a fair and just one. Accepting the statements of the makers in the factories where this system has been adopted as most practical and trustworthy, they are a unit as to the great improvement in the condition and quality of the milk received. The milk is well aired and stirred, cleanliness is observed, the number of pounds of milk to make a pound of cheese is reduced, and the quality of the product improved. The patrons are stimulated in their efforts to improve their herds by a more careful selection, and the day is fast approaching when cows will be bought and sold according to the quality and quantity of milk given. The question of feeding and handling is also receiving increased attention, and as selection of herds and liberal and economical feeding are the two live questions for immediate consideration by our dairymen to-day, we may anticipate a rapid improvement along these lines as a result of the adoption of this system.

The plan of taking samples at the factory and preserving them, as explained in the bulletin on "Dairy School Work," has been followed by nearly all of the factories paying by "Babcock," and, as far as I have been informed, has given entire satisfaction. Any weekly tests made under my supervision could not have been more satisfactory. The readings were very clear, and no trouble was experienced with curdy matter or charred butter-fat.

In cases where the cream adhered to the sides of the sample bottles, when going to make a test, we subjected the bottles to a hot-water bath. In this way the cream was easily mixed again with the milk, and an accurate sample ensured. There appears to be a prevailing belief that it requires an expert to successfully operate the Babcock tester. Now, while I say this is a mistaken idea, I do not mean that a person can become too familiar with the work, but we find that it is being used against the adoption of this system in some of our factories. It requires a person of ordinary intelligence, who will take the trouble to become familiar with the system and exercise care in the work. I find it necessary when making a test to keep the samples as uniformly hot as possible until the readings are taken and the number of revolutions per minute as great as is compatible with safety, usually about one thousand. Our young cheese-makers, who are doing this work in their factories, are apparently meeting with the most pleasing success and enjoying the confidence of their patrons.

I am still of the opinion, as expressed last season, that the time of the men employed by the Association should not be so fully occupied with milk-testing, but more time should be given to instruction. Factories can now do their own milk-testing much more frequently, and therefore better than can an inspector, whose visits are limited, and owing to the fluctuations in the percentage of fat contained in normal milk from day to day, it would be much more satisfactory and fair to all concerned to have a doubtful sample of milk tested repeatedly before steps were taken towards prosecution. Let every factory adopt the system of paying for milk according to quality, and all cause of dissatisfaction and necessity for milk inspectors will be removed. I am confident that when this is brought about it will mark a new era of prosperity among our dairymen.

Mr. McEwan followed up his paper by urging upon cheese-makers the importance of exercising their judgment more and more. He considered that the average cheese-maker was well enough posted in the general principles of cheese-making, but more attention should be paid to conditions of the atmosphere and conditions of the milk. And again, he said in conclusion, you will observe that cows under the same conditions of feed and environment change from day to day in the quality and flow of milk. At the Chicago Fair the percentage of the fat of milk changed so from day to day as to astonish everyone interested. Sometimes the difference in the milk from the same cow would amount to as much as one per cent. of fat.

PRACTICAL POINTERS FROM WESTERN ONTARIO VISITORS.

Mr. Andrew Pattullo, President of the Oxford Dairy Association, was introduced by the chairman as one who had done considerable both by voice and pen to forward dairy interests in the west. He said: I am one of those present who did not come to make a speech. I came here out of curiosity, to see how you manage things at your gatherings in Eastern Ontario. In olden times, we are told, they had wise men in the east, and so I have come here to learn from your wise men of the east, in company with the Secretary of our Western Ontario Dairymen's Association. Your chairman has alluded to the fact that I came from the county of Oxford. Most of you know that that is the pioneer dairy county of the Province. It is true that the first factory in the Dominion was built in the province of Quebec, but just about the same time the first factory in Ontario was erected in Oxford, and the industry has since spread all around that section. But although we have been doing much in the west we have in recent years been watching with a spirit of friendly emulation the work you have been doing here in eastern Ontario. Allusion has been made to what has been done in Chicago at the World's Fair in the matter of cheese-making. That is something we are all proud of, and it will also put dollars into the pockets of our dairymen. Eighteen years ago we had also a sweeping success at the Centennial Exposition held in Philadelphia, and that in the infancy of the industry was almost as much of a wonder as the winnings on a larger scale at the Columbian Exposition. Some of the cheese exhibited at Philadelphia was equally as good as any shown at Chicago, but that success at the Centennial was largely confined to the makers of Oxford county. However, it helped to introduce Ontario cheese to the connoisseurs of the old world, and I am glad to be able to say that the average quality of the cheese made in Ontario to-day is better than it was eighteen or twenty years ago. But although improvements have been made there are some directions in which we have gone just as rapidly as we might. And it was to find out if you are advancing as fast or faster than we are in western Ontario that I and my friends came here to-day I happened to be born on a farm, and I worked on a farm until I was almost as big as I am now. I remember that when thirty years ago a man talked about scientific farming the farmers would turn up their noses. They thought that scientific farming was all very well for men up in the clouds or men who were deep students, but that it did not concern them. And I remember that when the Agricultural College was founded, and for many years after, there was positive hostility to that institution, and doubts were expressed as to whether it could ever render any good results to the country. But all that is changed, and we have not only that excellent College—the best educational institution in the country—but other government farms have been established at Ottawa and elsewhere, for the encouragement of agriculture. Do not send your boys to the Collegiate Institutes to the exclusion of the Agricultural College. The feeling is now strong among public men, as well as among many farmers, that we cannot have too many institutions in the way of model farms and agricultural schools, which give a most practical education to those who patronize them, and that, too, at the least possible cost. Let us all do what we can to encourage this phase of scientific agricultural development. All the work these institutions are doing in a scientific way is, as Prof. Dean has said, the work you are doing or trying to do, whether you know it or not. You are engaged in a scientific business,

whether you will admit that fact or not, and unless you conduct your business on scientific lines you will fail. Now, having said that much, I would like to know as an observer and as a practical man, to what extent you are putting your science and theory into practice in the everyday work of the factory. In the county of Oxford, where we pride ourselves upon our doing things well, we fail to do some things properly. For twenty years we have heard the old, old story of scientific dairying preached, but they have not been carrying it out as they might. And what have you been doing here in the east? You have heard Governor Hoard and others tell you about the dairy cow,—what sort of udder she has and all that—but have you been improving the dairy cow? I regret that in the county of Oxford we have not been following out this teaching as we might. They have not been keeping a close enough watch upon the milkers, and selecting as good females and also as good male dairy animals as they might. The point is this: You may come here and listen to these addresses in reference to the dairy cow, and get other dairy pointers, but these hints are of value to you only as you use them. Unless the patrons put these sound theories into practice all that is presented in the speeches and papers on the dairy question will be of little or no account. In the matter of feeding—assuming that the evolution of the dairy cow has given us a better animal than formerly—we have not been treating the dairy cow as we might. In western Ontario it is quite the exception for a man to have a silo. I am glad to be able to say that the silo is a success. It has been shown by experience during the past few years that it pays to have a silo for the dairy. I am sorry to state, on the other hand, that in driving through the country I have noticed that despite the instruction received at these conventions, some dairymen still keep their cows in the open air in winter. The cow will get run down, and it will take a good deal of feeding in the spring to get here into condition again. The animal should come out in the spring as sleek as she goes into the stable. It is in the observance of these little practical details that the success of the dairy depends. I listened with considerable interest to the last speaker on one point, and that was in regard to the matter of cleanliness. I am sorry to say that in South Oxford, right round the original factory of Mr. Harvey Farrington, there is a cluster of factories which allow the milk to be taken back in the cans—a vicious and wasteful practice. Not far from Woodstock also there is another cluster of factories which will not allow patrons to take back whey. Both of these groups of factories send their product to the Woodstock market, and it is beyond doubt that the factories getting the best price for the cheese are those which will not permit the whey to go back in the milk cans. The buyers will always stretch a point in order to get the cheese made in a factory which will not allow the whey to be in the milk cans. I admit that hog raising in profitable, but what you gain in pork in this manner you will loose in cheese. It is too much like the Irishman who said that he sold his goods at five per cent. under cost, and that he would make his profits on the large sales. (Laughter.) I heartily agree with the speaker this morning who took the part of the makers, and who declared that the cheese-makers were not getting enough out of the business; and I was astonished and pained to hear that some of the makers could not come to this Convention because, like some of the farmers, they were too hard up to pay their way here. The tendency is to allow the maker to suffer most if all does not go well. But often makers are themselves to blame. They will cut each other down in their rates. I would strongly advise patrons to keep on a man who is trained and experienced, and the better cheese he makes the better you should pay him. Do not squeeze the maker beyond a living price. Makers should be compelled to go to the Agricultural College or Dairy schools. They should then command good incomes. The less progressive patrons, who are shallow men, and who are usually the men who send the bad milk to the factory, should not squeeze the life out of the makers. This is for western Ontario (laughter), but of course you will take it as people take the sermon—apply it to the other fellow. (Laughter and applause.) It is with the cheese-maker as with the school-master. I know a man in the west who as a teacher for many years has had to do his work for $380, and because someone with stylish manners and little capacity came along that old, well tried and experienced man lost his position. Now, I would like too see the people of this country develop not only good cheese-makers but also as good cheese eaters. We have trained the people of Eng-

land to eat our cheese; and they are excellent judges. But if you have any culls in your factory what do you do with them? You send them to Peterborough or Woodstock or Toronto. I tried for six months to get a good cheese in Woodstock, but without avail. I had to write to Mr. Alexander McLaren, and he took compassion upon me and sent me some good cheese. An enormous amount of business could be done if our makers, factorymen and grocers were to unite to cultivate the home market. The home market of the United States has been so cultivated that most of the cheese made in that country is consumed there, and in the latter part of the season there is but little exported to England. The speaker then adverted to the close connection between the dairy interest and the question of good highways, and brought out some striking points in favor of better country roads. Full notes of an address by Mr. Pattullo upon this subject will be found in the report of the proceedings of the Roads Convention held in Toronto in February, 1894.

Mr. J. W. Wheaton, Secretary of the Western Dairymen's Association, was next invited to the platform, and spoke as follows: It is a pleasure for me to have the privilege of attending the Convention of the Eastern Dairymen's Association. I have the very highest respect for dairymen wherever I meet them, whether it be in my own western section or in this the eastern part of the province. As a rule the dairymen are as good a class of fellows as you can meet in a day's travel. The attention of visitors to the Chicago Exposition was drawn to this country more by the exhibit made by our dairymen than by any effort put forth by any other industry or profession. I believe also that every intelligent, progressive dairyman is building up this province and making it what it should be—the fairest land on this continent. The *Dairy World*, a paper printed in London, England, the other day had a skit, which puts the dairyman in a new character. Mrs. Montague, calling upon her friend Mrs. Smith, said: "I am almost envious of you, dear Mrs. Smith, because you have a nice little family about you and I have none at all." Young Smith, nine years of age, spoke up in a sympathetic and helpful tone, and said: "Oh, Mrs. Montague, why don't you arrange with our dairyman. He supplies families; I saw it in his advertisement." (Laughter.) Now, that was really expecting too much from the dairyman. If the dairymen of Ontario had not combined years ago and organized an association at that period in the history of the dairy industry, I venture to say that at the present time we would not have been turning out half the quantity of cheese we now do, the quality would not be so good, and we would not have been getting so many medals from the World's Fair of 1893. The early work of the Dairy Associations was devoted largely to educating the manufacturer, and not to educating the patron. But of late years the Associations have been bestowing more attention upon educating the patron. The patron is being instructed regarding the proper care of his cows, the proper feeding of his cows, and the proper selection of his dairy herd. In many of the factories in western Ontario the cheese-maker is compelled to give a first-class quality of cheese, no matter what the milk may be. But unless the maker is supplied with first-class milk you have no right to make such a demand upon him. The Dairymen's Association of Western Ontario is making a special effort in order to reach the patrons so far as improving the quality of the milk is concerned. In October, 1892, I took the position of Secretary of that Association, and some of my work has been in the way of visiting farmers throughout the western part of the province and talking on questions pertaining to dairying. I have attended some 70 meetings of factorymen during the past year, and Mr. Millar has reached some 20, while some of our directors have also visited factories and helped to stir up enthusiasm in the work. In summing up the work done by us, we found that we have visited some 7,000 dairymen and farmers in the province. We also held four local conventions in different parts of the western district, and have been wonderfully successful, particularly in Tilsonburg, where the attendance of farmers was larger than was ever before known at a dairy convention. We also endeavor to keep our work before the public by the aid of the press, and I am pleased to say that many of our members have come to our assistance in this good work of helping to promulgate dairy knowledge.

Mr. J. S. Pearce, of London, was introduced as a Western Ontario visitor, and spoke as follows: I have been very much interested in the discussions which have been going on this afternoon, and I would like to emphasize one or two matters that have been

referred to, and then speak of what I have seen at Chicago. One of your inspectors referred this afternoon to the very unsatisfactory way in which factories are competing with one another in running milk waggons over the same territory. These factories are called co-operative factories, but it seems to me that some of the patrons and managers act as if the factories were not co-operative, but were operating against one another. There is no reason why two or three waggons should go over the same road. The factories should mutually decide that this useless and extravagant waste of energy and money should be stopped. If this were done, and they also agreed among themselves as to the quality of milk which should be supplied factories, they could easily put these unsatisfactory patrons in a position where they would not be able to say: "If you do not take my milk somebody else will." There is no reason why the various factories could not arrange that a patron could not speak to them in this fashion, and the consequence would be that a general improvement would take place in the quality of the cheese. Then there is the matter of paying the cheese-makers a living price, as was referred to by a speaker this morning. It has often occurred to me, and I have felt it to my cost, that it was unsatisfactory and unwise to hold cheese-makers down to the last cent. You hold these men responsible for the quality of the cheese made, and yet you do not give them full power and authority regarding the quality of the milk they may take in. Give the maker control in this respect, and then you can fairly hold him responsible for the quality of the goods he makes. The price paid to makers in many cases is inadequate, and should anything happen by which he makes a lot of cheese which is not up to the mark the result is that he is out of pocket and cannot make both ends meet. And that means that the man who has furnished him with dairy supplies is often the loser in the end. I shall now refer to two or three things in regard to the World's Fair and our dairy exhibit. Being one of the judges of butter, in June, I had a very good opportunity of seeing the dairy goods there. You have all heard of the success we had at that great international exhibition in regard to our cheese. Unlike our butter exhibit, there was a large display of cheese. But though our butter exhibit was small it was very creditable in quality, although it did not come up to the American article. Still there is no reason why Canada cannot make as good butter as can be manufactured in the United States. With the aid of the Minister of Agriculture, the Dairy Commissioner and the schools I can see nothing to prevent us making just as good butter as they do on the other side of the line, with the like attention to details. It struck me as very strange that there was no working dairy in the agricultural building. The test building was not at all suitable for the purpose, and the American exhibit of cheese and butter was to my mind a complete failure. They had a great opportunity of giving visitors an object lesson in the manufacture of cheese and butter. We Canadians may well feel proud of the advantages we had there through the able management of our various officers in charge of our exhibits. I will pay fuller attention to the butter question at the Creameries' Association to be held shortly at Belleville, and so shall not occupy the time any longer.

REPORT OF INSTRUCTOR BENSLEY.

Mr. President and Gentlemen: Permit me most respectfully to here submit this my first report as instructor and inspector for the season of 1893: As you are aware, my district includes Peterborough, Northumberland, and part of Hastings and Prince Edward counties. My work was so scattered as to occupy a great deal of valuable time in travelling over the territory. The first factory visited was on June 26th, and 71 visits were made to factories, ten days travelling, one day attending cheese board, making a total of 85 days in the employ of the Association. I tested 3,318 samples of milk. I found the milk, on the whole, of a very good quality, as there were only eleven samples that had been tampered with. All of the offending parties were dealt with by the officials of the different factories.

I cannot give you a full report as to the average percentage of butter-fat per month, as my work was not steady through any one month. This shows the necessity of beginning early, and thus enabling the instructor to give a full and concise report of work done.

Factories, with very few exceptions, were found clean and tidy, which is very essential in the manufacture of fine cheese.

Should I ever have the honor to appear before you again in this capacity, I hope to be able to give you a more favorable account.

G. H. Bensley.

REPORT OF INSTRUCTOR PURVIS.

Mr. PRESIDENT AND GENTLEMEN,—In presenting my report for work done by me as your instructor for 1893, I wish to call your attention to several circumstances which tend to make the district to which I was appointed a peculiarly difficult one to report a large amount of work done in. The cheese factories are as a general thing late in getting started in spring, and do not require the services of an inspector before June, and the district also contains some of the largest combinations in the Dominion, which employ their own inspectors. The applications for my services came in so late that I was unable to lay out my work to advantage, and was compelled to do a lot of driving, which would have been unnecessary had I received the applications earlier in the season.

It would be far more satisfactory to all concerned if factorymen would apply for the services of the inspector early in May; then he could lay out his routes so as to work every day. The factorymen of Prescott and Russell are becoming aware of this, and have already made application for several visits from me for next season—some factories for as many as four visits during the season.

I started working for the Association on the 9th day of May, and quit work on the 20th of October, visiting fifty-seven factories, and making in all seventy-six visits, testing milk on each occasion with lactometer and Babcock tester.

I spent twenty-three days driving on the road, working in all ninety-nine days. The following are the names of factories visited, and the number of visits to each: Goldfield, No. 1, 3 visits; Pendleton, 4; Ouillettes, 1; McPhee's Ferry, 1; Crysler, 1; South Branch (Russell), 1; Craig & Son's, No. 1, 2; Craig & Sons, No. 2, 2; Camerontown, 1; East Hawkesbury, No. 1, 2; No. 2, 2; No. 4, 2; Horse Creek, 3; Routhier, 1; Fournier, 1; Alexandria, 4; N. Lancaster, 1; Bainsville, 1; Riceville, 2; Tourangeau's, No. 1, 1; No. 2, 2; Treadwell, 1; Alfred, 1; The Brook, 2; The Lake, 1; Clarence, 1; Cumberland, 1; Chard, 2; Spencerville, No. 1, 1; No. 2, 1; No. 3, 1; No. 4, 1; Archer, 2; Elma, 1; Connaught, 1; Tait's, 1; May's Fancy, 1; Lalonde, 1; Plantagenet, 1; Wendover, 1; Sarsfield, 1; Spring Grove, 1; McAlpin's, 1; Goldfield, No. 2, 1; Lunenburg, 1; Wales, 1; Rose & Co., No. 2, 1; Metcalfe, 1; Rose & Co., No. 1, 1; Scott's, 1; North Williamsburg, 1; Glenbecker, 1; Hoasic, 1; Linton's, 1; Finch, 1; St. Eugene, 1; Tayside, 1.

Of the 3,366 samples of milk tested by me 32 were found to be deteriorated. The accused acknowledged their guilt, and settled by paying fines varying from five to forty dollars, with the exception of one who swore before a magistrate that he had not sent milk to the factory on the day in question, and so got clear.

I found the factories generally in good condition as regards cleanliness and equipment, and while some were models of construction and convenience a few were totally unfit for the purpose of making and curing cheese in, but I am pleased to say that there is a strong tendency toward the construction of better buildings.

A. P. PURVIS.

Mr. PURVIS supplemented his report by the following remarks: Patrons have themselves largely to blame for not seeing to it that more co-operation exists amongst the various factories. In some places factories are too thickly situated. It is not unusual to see two or three waggons of different factories passing along where one waggon could take all the milk. I have seen a milk waggon pass a factory to go to another factory four or five miles further off, and over bad roads, and when I went to the second factory I would find that another waggon would go past that to still another factory three or four miles still further away. Go to a maker and talk about a patron sending a dirty, greasy milk-can, and he will answer, "If I say anything to him he will go past me to that other factory." The matter of greasy curd demands attention. The trouble is that owing to the peculiarity of the season the fat has started before the curd is ready to work. The curd should be cut fine and dipped with an ordinary amount of acid and stirred until quite dry. By cutting it fine and stirring it for a little you get the moisture out, and in that manner a good cheese can be made. If you wait until the grease runs in the pan it will be too late too redeem it thoroughly. The majority of the cheese which goes off flavor is cheese which has retained too much moisture.

The meeting then adjourned.

FIRST DAY—EVENING SESSION.

The convention re-assembled at eight o'clock. The president called the meeting to order, and invited Mr. J. Kendry, Mayor of Peterborough, to take the chair, and preside during the session. The mayor said: I am very glad to welcome the Convention of the Dairymen of Eastern Association to Peterborough. I am sorry we did not sooner know about the Convention coming here, as the council would have made some fuller endeavor to have welcomed the delegates. I regret that for my part I did not know of the coming of the Convention until the previous Friday.

Mr. Wm. Cluxton, a local cheese buyer, was invited by the mayor to speak to the visitors, and said: The excitement of the municipal elections has prevented much attention being given to the coming of the Convention. You have met together to get fuller information regarding dairying matters, and more especially to discuss the improvement of the manufacture and handling of cheese. When I first began to buy cheese I started, as most buyers then did, in a small way; I shipped it to Liverpool and sold it for four or five cents a pound. At that time Ingersoll was the famous cheese country, and the makers could sell it c.i.f., that is, charges, interest and freight prepaid; but Peterborough can be sold readily to-day. We have with us to-day, Mr. Warrington, of Belleville, whose father established the Canadian cheese business in England, and his brother in Montreal is an important shipper, too—he will tell you that he is buying Peterborough cheese just as soon as it is made or perhaps the day before. I believe that the factories, and not the cheese-maker, should buy the boxes. The cheese-maker is held down so low in his rates that he has to buy the boxes as cheaply as possible, and the result is that the factory suffers more than anyone else in the end. In the case of a good factory furnishing a good article of cheese in good boxes properly cut down and nailed we are willing to pay a cent a pound than we would offer for goods from a factory which binds down the maker too much. I cannot too strongly urge all in the trade to use good boxes. Closer attention to the management of factories will result in a more uniform make of cheese, which is a matter of importance in the cheese industry.

Mr. Sanderson, a member of the local Cheese Board, said he was one of the committee who should have attended to making provision for the entertaining of the Convention, but he regretted that owing to illness he had been unable to give proper attention to the matter.

Police Magistrate Dumble said: I hardly know why I have been called upon. It cannot be because of my official capacity, for I have but little experience in dealing with farmers, having to depend largely upon our local industries. (Laughter.) I trust that the Convention will be pleased with the choice of Peterborough, as we are pleased to welcome you here. The first man was made of clay, and everything of value has since come out of the ground. I have a rood or two of ground, and it is a surprise to me and to others what I can get out of it. The dairy industry has been wonderfully developed in this province. We have now a first-class make of cheese, and we are proud of it, but it has not come by chance. The excellent quality of our cheese is the result of continuous, systematic, scientific work. One man said to me to-day: "What about all these Professors floating around here? Does the Ontario Government keep all these fellows gadding about the country?" I said, "My dear fellow, don't run away with that idea. These men are instructing and helping the people to improve an industry which already brings into the pockets of the farmers about $12,000,000 a year." Mr. Dumble then paid a high tribute to the natural resources of Canada compared with the southern part of the North American continent.

WINTER DAIRYING IN ONTARIO.

Mr. J. A. Ruddick, of the Central Experimental Farm, delivered the following address: I have been asked to say a few words to-night regarding the progress of winter dairying in Ontario. The reason that I have been selected to talk to you on this subject is, doubtless, because since the inauguration of the movement I have been somewhat closely connected with it under Prof. Robertson's direction. During the present season I have been in charge of the work in Western Ontario. In 1891-2 there were only two winter creameries in Ontario—that is cheese factories which had been fitted up for the purpose of making butter in the winter. I have been reckoning up the matter lately, and I find that this year there are twenty-one winter creameries in operation in different parts of this province. There are three in Glengarry, four in Leeds, one in Dundas, two in Lennox, two in Hastings, one in Brant, five in Oxford, two in Middlesex, and one in Perth. Five of these are operated as Government dairy stations, namely, two in Oxford, one in Middlesex, one in Hastings, and one in Dundas. As most of you are aware, the

past season has been a poor one for dairying in every sense of the word in the western part of the province. The supply of feed has been very short, and I know that up in Oxford, and that part of the country, even the corn crop has been somewhat of a failure, and thereby the supply of fodder for producing milk in the winter time is rather deficient just now. It was therefore feared that the winter creameries would fare rather badly this season, but we find that around Mount Elgin and Woodstock, instead of going back, as some expected, that a very much larger amount of butter is being made than in last year or the year before. In the immediate neighborhood of Woodstock we have now five winter creameries in operation, and I took the pains to find out how much they made in the week ending December 23rd. These five creameries manufactured seven thousand eight hundred pounds of butter in that the last week of 1893, while the two creameries the first year made only twenty-two thousand pounds in all that season. The people there have come to look upon winter dairying as something that has been established, and that has come to stay. This winter the supply of milk so far has been rather short with some of them simply owing to the fact that they have arranged as far as possible for the cows to come in early in February, and that prevents them from sending in as much milk just now as in former years. In Woodstock at the present time they are receiving milk almost entirely from fresh cows. They are finding some little difficulty, of course, during the present winter in supplying the proper kind of feed for winter owing to the extreme dry weather of last summer and also during the fall. In conversation with the patrons I met during the course of my work while visiting the creameries, and in the towns of Woodstock and Ingersoll during the week, I find that they seem to be particularly well pleased with the idea of getting rid of this work of butter-making at home on the farm. Formerly the butter that was made after the cheese factory closed was considered merely as a side issue. They paid but little attention to it. They had not the best utensils, and the cows were allowed to go dry soon and remain dry until spring. But now, when they find that by feeding a little extra and keeping the cow in good condition by proper care and attention, they can get from 95c. to $1.10 a hundred for the milk, and have skim milk besides, and get ready cash for it instead of taking their butter to the store to be mixed with other makes, they are giving fuller attention to winter butter-making. In that part of the country there is very little for the farmers to do at this time of the year but take care of their stock, as the timber is pretty well off, and there is but little winter work to do with teams. Farmers are beginning to figure this way: If we can get work for hired men during the winter, then we can hire our help the year round and thus get better men than if we employed them only a part of the year in the summer. So far we have found no difficulty in disposing of the butter made in that section. Although I have to attend more particularly to the Government factories, I am pleased to assist private factories in giving hints as to the disposal of their butter. Most of these creameries have sold butter at twenty-four or twenty-five cents a pound at the factory, while the butter offered by others on the local markets of Ingersoll and Woodstock usually received but eighteen or twenty cents a pound. You can easily see the advantage of factory-made butter in view of these figures. In the creameries they have the latest improved machinery for handling milk, and can recover from twenty-five to thirty per cent. more butter from the milk than can be done by any method of making at home. I am often struck with the margin there is in this dairy work for getting a return for a little extra skill put into the business. It is often the case that butter is sold for fourteen cents a pound with first-class creamery butter selling from twenty five to thirty cents in the same market. The simple fact of the matter is that one man has put skill into his work, and he has enhanced the value of his product to that extent. You may put skill into the tilling of a field of wheat, but that will not add to the value of the wheat per bushel, although, of course, you may increase the yield. But in the matter of the dairy you may increase the quantity as well as the quality of the product by putting additional skill into the work. There is one feature in connection with this movement of working a dairy in connection with a cheese factory, and which has been carried into effect by two or three companies, which strikes me as a good idea. There is a cheese factory to the south of Ingersoll, at a place called Culloden, where they introduced a separator during the summer, and make up the milk of Saturday night into butter. That practice was

carried out all the summer, and the patrons took most of this Saturday night's butter for their own use, the balance being sold to a local grocer. Where this idea is carried out it is necessary that a separate building or room should be arranged for the making of the butter. It would not do to move out the cheese-making apparatus and put in the butter-making appliances every Saturday night. The outlay at first may seem considerable, but it pays in the end to put up a separate building or add to the rooms. So far the butter that has been made in Ontario has chiefly found a local market. It is also having the effect of crowding out a great deal of the poor butter that is being offered by farmers on the markets. I know for a fact that in the town of Woodstock the butter made in the creameries has been retailing at thirty cents a pound in the groceries when otherwise they were offering very good butter at from twenty-two to twenty-five cents. I do not mean to say that creamery butter is always better, for I think that just as good butter may be made in the private dairy. Sometimes even the creamery milk is not in the best condition. But when the customer buys from the creamery he knows that the chances are that he will get a good, uniform quality of butter, and it is a great advantage to be tolerably certain of getting that article. I might dwell for a short time upon some of the practical aspects of the work, such as the difficulties we have to contend with in making butter in the winter time, but I do not think it would be wise to follow up these lines of thought to-night. I may say, however, that I have often heard the objection raised, when the question of winter creameries was brought up, that it would be impossible to deliver milk to the factories in cold weather and keep it from freezing. Now, I can say that although we have had some very cold weather during the past two or three winters, we have never had any difficulty in that respect. The milk has been agitated by the carrying, and has never been injured by frost. These objections are more imaginary than real, and it can be safely said that winter dairying is as successful as summer dairying. I think that in a very short time our winter dairying business will be second in importance only to the summer cheese-making. And I do not believe that butter-making in the winter time is opposed to summer cheese-making. It strikes me that in many ways it will be a benefit to the cheese trade. When patrons get into the way of having cows come in at all seasons of the year we will have a more even quality of milk. But now when the new milk comes in in the spring time, it is not as rich as it should be for a first-class article of cheese, while in the fall the milk is sometimes richer than it need be for a first-class article. I feel confident that in those factories where they are making butter in the winter, that the product of the cheese made in the summer will be more uniform in quality. Speaking of the cheese-maker as a manufacturer, I think there are many ways in which he will be benefited by this plan of winter butter-making. In looking at the books at one of the creameries the other day, I figured out the value of milk per hundred pounds during the month of December, and found that the patrons of the factory will receive for their milk $1.07 per hundred pounds, and pay three and a-half cents a pound for making the butter. This is in addition to the value of the skim-milk, which is returned, and when sweet is used to advantage by many patrons in feeding calves. This is considered by the patrons of the creameries to pay them very well. One of our patrons thought that the skim-milk returned to him from the creamery paid him for the extra amount of feed which he gave to his cows for the winter time, and if so, then he had his butter for the trouble of milking his cows and taking the milk to the factory.

SCIENCE AND PRACTICE IN DAIRYING.

Mr. C. C. James, Deputy-Minister of Agriculture for Ontario, then delivered the following address :

I suppose I shall have to consider myself as one of those who are "floating around" —to quote Mr. Dumble's friend—and have struck on a rock or sand bar which will keep me here for a day or two. However, it is not Ontario officials only who are floating around, as you will see that the Dominion Government has some very active and important floaters present. (Laughter.) No business has come to the front in Ontario during the past twenty years like the cheese industry. I am surprised that my good friend who

has preceded me did not go into raptures over our success at Chicago. Everybody else has been bragging about it. The Americans have probably learned more about the cheese industry at the World's Fair than we Canadians have. They have been taught just where their mistake has been. They said after the first defeat that they would show us in the fall what they could do, but they will have to go home and work and learn and experiment before they can equal or surpass the Canadian make. Now, if we were to take up the subject of, say barley at an agricultural gathering we would be divided. Some of us would want two-rowed barley—(laughter)—and others would want six rowed barley. (Renewed laughter.) And if we took up the matter of eggs there would also be a division ; some would say, "Give us the American market," and others would say, "Let us cultivate the old country market." And if we took up the question of agricultural implements some would say, "Give us free trade," and others, "We want protection." But when we come to cheese we have a common platform. There are no politics in cheese-making. (Applause). Conservatism and Liberalism have nothing to do with it. It has been supported by governments of both sides of politics, and has been aided by both parties in the Legislature and in the Dominion Parliament. Our cheese industry is a subject upon which we are all united. Protection, bonusing, etc., have had nothing to do with its development and advancement, and we hope never will. We might be disposed to think that the object of cheese-making is one that should never arouse much thought, or interest, or enthusiasm. You may say, "Well, the making of cheese is very small compared with the manufacture of shoes, of woollen goods, of cottons, etc." Now, what do we mean by cheese-making in this country ? Is the making of cheese confined to the factory ? Is it merely a turning of the milk into the factory vat, and the changing of that milk into the article we call cheese ? That cheese has been produced out of the milk, and that milk out of the food which has been given to the stock ; the feeder of the stock as well as the workers in the factory have had a very important share in the making of the cheese. And we can go further and find that out of the constituents of soil, rain, and atmosphere, we have turned out an article we call cheese. In the production of the milk and its manipulation into cheese we have three or four lines of manufacturing, in all of which the dairyman is very much concerned. In the first place the dairyman's work is intimately associated with the soil in which the crop is produced ; with the plants forming the crops, their tillage, handling, and storage ; with the feeding and care of the animals, and finally with the handling of the milk when it gets to the factory. So we see that the necessity of skill, and we may say science, confronts him at every step. But when we use the word "science," someone says, "Please don't use that word ; we can get along without it." Some man may call himself a scientific dairyman, and another man who does not claim to be scientific may make just as good cheese or butter. But the second man may be going along correct scientific lines without being aware of it. However, the word science has lost its terror to most of our farmers, and few are now afraid to hear it. And science has indeed been a friend to the dairyman. We have now a little machine by the aid of which you may, by simply putting a little milk into a tiny bottle with some chemical and turning a crank quickly and accurately measure the proportion of butter-fat in the milk. Now, did some one pick that fact up by chance ? No ; you must go to a man who had been studying dairy science, and after years of experiment he has devised that machine which is now used in dairies from one end of the country to the other. What is science ? Science is knowledge—ordinary knowledge—made exact and systematically arranged. It is very important to the farmer to know what his land contains, what crops are best suited to that soil, and what treatment is necessary to keep the land in best condition. But how are we going to get this knowledge ? We must get it by practice, by digging it out by hard personal work and observation, or we may get a great deal of it from the various agricultural books and journals that are published. Or if we desire fuller knowledge of dairying we may get it through the dairy schools, the Agricultural College, or the dairy instructors. The point is, that if the Ontario dairyman would hold his own with the American dairyman and not lose ground, he must see to it that he does not neglect any part of his dairy work, nor must he lose or neglect any opportunity of getting exact knowledge regarding that work. He should attach himself to an Association of

this kind, and have on his table at home the best dairy literature in the way of text books and journals. He should go and hear men who have been making a life study of dairy work. They should also try and get these men to come and address the patrons of the local factory; if not in one way then in some other way dairy knowledge should be spread about, absorbed, and acted upon. The dairyman who does not get the results of latest and best thought regarding the industry must fall behind. In the development of the cheese industry we have had the co-operation of the women and also of the young people. I believe that in the future the importance of the dairy industry will be magnified more and more on the farm, and that all this knowledge may become more generally utilized so that in the next decade more advancement may be noted than we have seen in the last, although that has been very great indeed.

OUR CHEESE EXHIBIT AT THE WORLD'S FAIR.

Prof. J. W. Robertson, Dairy Commissioner, Ottawa, was called upon by the Chairman as one needing no introduction to a dairy audience and said: I am very glad to be again at a convention of the Dairyman's Association of Eastern Ontario. Seeing that I have a large subject to deal with to-night, I shall feel at liberty to make a short speech. I find myself here to-night—one of those atoms of humanity who are said to have "floated" into Peterborough in connection with this dairying industry. And yet, candidly speaking I did not "float." I came with plans aforethought. (Laughter and applause.) It is a good thing for the dairyman and every other man to row his barque and not to float. It is because so many men "float" that so little real progress is made in every walk of life. And many a man rows successfully up the stream of life whose hands are not the hardest. The boatman rows with less effort the more he has of a clear conception of where he wants to go. Many a man has failed to make ends meet in the dairy business simply because he did not have a clear idea of what was required in order to achieve success. If a dairyman has a definite conception of good management and never "floats," he will get into a safe harbor financially. But without that clear thinking and brave and honest doing he will never enter the haven of financial prosperity. . . . It is the aspiration of all men to get to heaven. They may call it sometimes by another name, but they mean the same state or place. And that is what I mean when I say that dairy farming is the salvation from financial stringency of the Canadian agriculturist. Dairying saved this country from the great financial stress of last year. Over $13,400,000 came into this country in 1893 in gold for our cheese. (Applause.) You may speak of plans to enrich the people, but unless the land is made to bring forth plentifully, the farmer will have to go with little that he can call his own, and the people generally will be poor. There has been in some years past a mournful lack of accurate information about the methods of farm work; but now with our conventions and experiment stations and colleges and all these various means of disseminating agricultural knowledge, our people are almost embarrassed with the plentitude of information they have. I find it a mental impossibility to remember one-tenth of the good things I hear at the agricultural meetings I attend. What you want as farmers is not so much to be loaded down with information as to get possessed of by some thoughts that will awaken dormant energy and set you to setting yourselves to work in real earnest. We want something that will take hold of the farmers of Canada and shake them up and wake them up to a better knowledge of the possibilities of their soil and its culture and make them prosperous by an increased intelligent activity. I meet some farmers who are discouraged, and they say in effect, "Ours is a poor business; it is a contemptible occupation." A man's practice can hardly rise above his thoughts. But since the World's Fair we have given every Canadian farmer something to boast about. We have been glorying over the success of the Canadian cheese exhibited at Chicago. And how did our great success there in the face of the competition of the world come about? Simply by the patient, persistent, intelligent labor of men. I shall speak to you for a while on the value and effect of persistent labor. "To labor is the lot of man." If men generally did not labor they would not be half as good as they are.

If you can by any means make a man who has lost everything except his heart take heart again you have rendered him the biggest sort of a kind service. Farmers have become despondent all over the country except in dairying sections, for dairymen have been having their monthly cheques come in. It is really encouraging and comforting to have a monthly cheque come in. (Laughter and applause.)

Farmers want a little more aspiration in their work. We must not only believe in ourselves, but we must try to excel in our work. Most men are too much inclined to do their work just well enough to pass. I sometimes have to sift men in my department and see whether there is excellence and sterling worth beneath the surface. Too many cheesemakers are willing to make a cheese just good enough to pass without being culled out.

We want more self-reliance among our dairymen. We want men who can depend upon what has come to their knowledge through their own senses as well as what has come through other men's observations.

It is said that money can be made in dairying, but that it cannot be made in grain-growing; but unfortunately there are men engaged in dairying who are not making money. Many of these unsuccessful ones, however, believe in two hours' thinking work a day—which is worse than the latest fad of the socialists. These men have cows which give 1,500 lb. of milk per season, while men like Mr. Whitton have cows giving 6,093 lb. each in six months. One man lives here and makes well out of his cows; another man lives just besides him and makes nothing. You see there is a difference in the men. There is just as good soil in New York as there is in Ontario, just as good weather, just as good corn and just as good cattle; yet the whole of the United States in fair competition in cheese in June managed to get nine awards, while Canada got 129 awards out of 162 exhibits. There was a difference in the management, in the way the men producing the article applied themselves to the work of making and exhibiting first-class cheese.

We had as one object in going to Chicago, the advertising of this country. We wished to let the world know who we are, what we had attempted, what we had accomplished and what we would be able to do bye and bye. We were bound to advertise the resources and the attainments of this fair land of ours and let it have a good name as a progressive and industrious country among the nations. "A good name is better than riches." Do you suppose that if a man believed that a good name was better than riches, he would run the risk of losing that good name by sending milk of suspicious quality to a cheese factory? (Laughter.) But we went to Chicago to get a good name, to stimulate our customers to buy more of our goods and to stir up our makers to do better work. There is another good word which I might also repeat: "The hand of the diligent man maketh rich," and we want to show that the diligent man is able to get rich in Canada. We want to show that dairymen should work twelve months in the year instead of six. Why is it that out of all our cheese factories only a few are used in the winter? We should make our diligence bend to manufacturing butter in the winter. We must not push the cheese trade too much. We now send to England half the cheese which that country imports. If we monopolize or appropriate that market to a much larger extent, we will push our competitors so hard that they may in self-defence devise some imitation in the hope of destroying our primacy. Let us make more butter. But let me once more refer to the big cheese exhibited at the World's Fair's. We decided to do something out of the common, and so that mammoth cheese was made. No single exhibit at Chicago received as much notice as that big cheese. That one exhibit got people all over the world talking about Canada as a cheese producing country. If we had sent a car load of cheese that incident would have been passed over with little or no attention. None of the United States had a cheese exhibit in the main agricultural building. There was a little dairy building, but we could not get our big cheese into it, so they let us put it in the big building, and we had to keep it company with our ordinary-sized cheese. (Laughter.) The big cheese stood the test of that hot weather splendidly. In October it was tested 33 inches deep, and it was found in excellent condition. Some of it has spoiled since, but the injury is only slight. We perhaps made a mistake in allowing the cheese to go out of our own hands after it had served its purpose

so well in advertising the country to the extent of many times over its own value. We sent cheese to Chicago made in 1891, 1892 and 1893. That of 1891 was to demonstrate the keeping quality of our cheese, and grandly it did so. We had 150 cheese over a year old, and 120 of these were recommended for medals, and these cheese were from five different provinces of this Dominion. It was first announced that Canada would send cheese to Chicago four times during the summer. We succeeded admirably in June, but it would not have been of much advantage to repeat that again. The exhibitor could get but one medal, no matter how often he might be successful, and that meant little or no additional prestige although it entailed considerable extra cost. We sent from Canada 539 exhibits of cheese and 167 exhibits of butter. The cheese were judged in June and October. Two of the judges were from the United States and one was from Canada—one from New York, one from Chicago and one from Ontario. It was decided that an effort should be made to have the cheese so judged that the judges would not know from whence they came. The cheese from the United States were on one table, the cheese from Canada were on another table, and the judges did their work on still another table behind a thick screen. The cheese were placed on the judges' table indiscriminately; there was nothing to indicate whence they came, as they bore only the official number—no brands or other marks being allowed. The cheese were thoroughly mixed on the judges' table, and there could be no bias in favor of or against our cheese. It was a perfectly fair method. I will now give a statement showing the number of exhibits made by the Dominion, by provinces, together with the number of awards recommended:

Ontario	sent	412	exhibits, of which	387	were recommended for awards.	
Quebec	"	229	" "	199	"	"
Prince Edward Island	"	23	" "	12	"	"
Nova Scotia	"	21	" "	10	"	"
New Brunswick	"	12	" "	7	"	"
Manitoba	"	4	" "	3	"	"
		701		618		

There were only about 54 lots recommended for United States exhibits in these classes while Canada had 618 recommended. Over 90 per cent. of our exhibits were recommended. Ten lots scored as high as 99½ points. We had 127 firsts before the United States scored, our competitors coming in as 128th. Every province, from Manitoba to the Atlantic coast, were entitled to awards in that great exhibition. Five years ago we had some fine cheese and some inferior; but now we have cheese of a very fine quality in all the provinces, and we should try to get our butter of equally high uniform quality. The judges on cheese allowed 45 points out of the 100 for flavor, but how many cheesemakers care a snap as to how the milk or manipulation may affect the flavor so long as a cheese looks well on the shelves, does not puff or leak, or do anything improper in its behaviour? Cheesemakers should pay close attention to the matters of fermentation flavor, cream flavor and salting. Fermentation goes on because some living thing is in the cheese. I do not mean those bigger fellows which move around and skip so actively and visibly as to have acquired "skippers" as nickname (laughter), but those tiny living things in fermentation known as bacteria. Bacteriologists, by isolating these different bacteria, have discovered which cause some of the peculiar flavors of cheese and butter. For instance Bacterium No. 18 in cream gives an excellent flavor in butter, and if you buy a "culture" of that flavor you may impart an excellent flavor to your butter. (Laughter and applause.) Put a little gelatine upon a small piece of glass and leave it exposed in a cheese factory, and in a little time a number of different kinds of bacteria will settle upon it. So you will see that aerating milk is a good thing only when the atmosphere is pure to the extent that the bacteria and germs in it are wholesome. At these conventions we have a good deal of repetition of the

advice that the patrons ought to have their stables clean, their pails clean and their milk cans shining and free from every kind of filth, but do we always find faithful practice on the part of the men who preach this excellent doctrine of dairy cleanliness? I have been taught to have a great deal of respect for men whose hands were clean every way. I like a clean man—physically and morally. Cheesemakers' hands go into the curd and into the cheese. In meeting cheesemakers out of the factory I have not found one man out of ten whose nails were clean; and that means a lot. I want to rub this right in. If a man has not recognized the necessity of being clean, then he has not learned the first principles of successful dairying. It would pay Canada well if every cheesemaker would have a scrubbing brush on his washstand and have his nails cleaned regularly. It would mean a cleaner factory, cleaner utensils, cleaner stables and a cleaner product, for then the cheesemaker would be an exemplar of cleanliness to his locality. These may be called trivial matters, but some one has said that perfection is reached only by the perfecting of trifles, and perfection is no trifle.

SECOND DAY.—MORNING SESSION.

The Convention resumed sittings at ten o'clock. The attendance was large, and the audience appeared to be greatly interested in the proceedings.

THE WEATHER: ITS INFLUENCE UPON DAIRYING.

Mr. C. C. James, Deputy-Minister of Agriculture, was called upon to deliver an address, and in opening said that he felt like asking pardon for introducing a subject which perhaps was not so entertaining as some which might have been taken up. He then proceeded: There is an old saying, with which you are doubtless familiar, that "figures won't lie"; but that saying has been amended by statisticians to read this wise: "Figures won't lie, but liars will figure." (Laughter.) The discussion of the state of the weather is by some considered always in season—particularly when the weather is rather unseasonable—if we are to judge from general conversation. And so this morning I desire to talk for a while about the weather, and see if there are not some very patent lessons for us in this well-worn topic if we study the moods and caprices of the seasons in their relation to the great dairy industry. The weather plays a very important part in agriculture; in fact we may almost consider it as the most important factor outside of the farmer himself. In favorable weather even the most careless and shiftless may have good crops, whereas in unfavorable seasons only the most careful will have even fair crops. If the farmer could control the weather—regulate sunshine and rainfall—his would be a most prosperous business and success would never remove its smile from his daily undertakings. But to talk or think of controlling the weather is apt to cause a decided shake of the head if not a smile of pity for the suggestion. But let us see whether after all the farmer is not progressing in his endeavor to control the weather. Irrigation has made millions of acres of desert, if not literally to blossom as the rose, at least to clothe itself with fields of wheat and alfalfa, and to bedeck itself with the blossoms of the apple, peach and orange. Even the much-abused rainmaker has met with a qualified success or a qualified failure. These you say are remote examples. Let us come nearer home. Bad weather makes bad roads. Bad roads are bad principally because of bad weather. Bad roads mean increased cost and trouble in reaching market, increased cost of wear and tear upon animals and vehicles, decreased social enjoyment and increased dissatisfaction with one's work. Bad weather can thus produce "the blues," both directly and indirectly. The farmer begins to improve his roads, and then, through rain and sunshine, bad weather and good weather, he is able to spin along in his buggy, democrat or lumber waggon, and snap his fingers at the unfavorable elements. Thus to a certain extent he learns to control weather so far as it tends towards preventing him from going to market, to church, and to his neighbors.

The under-drainage of low-lying lands improves their condition in periods of drouth as well as of excessive rain. The soil is kept open and porous, so that the excess of water is removed and the air allowed to permeate and feed the soil. Good drainage makes the land less dependent upon favorable weather; or, to put it in other words, unfavorable weather has less retarding effect upon drained land than upon undrained. Good drainage is another means whereby the farmer may control the weather.

Unfavorable weather may affect the milk production of animals in two ways, first by limiting the supply of food available, second by making less productive the food that is given. First let us review the weather that Ontario has been favored with during the past year. The following table gives the average temperature and precipitation (rain and snow estimated as rain), for the ten months of 1893, 1892, and the average for 1882-92:

Months.	Average temperature.			Total precipitation.		
	1893.	1892.	1882-92.	1893.	1892.	1882-92.
	Deg.	Deg.	Deg.	Inch.	Inch.	Inch.
January	10.19	16.88	16.97	2.88	2.61	3.28
February	14.22	21.83	18.51	3.16	2.33	2.75
March	26.21	25.01	24.04	1.73	1.27	2.25
April	38.77	40.34	40.33	3.32	1.25	1.85
May	51.93	52.22	52.58	3.34	3.68	2.75
June	66.97	65.44	63.56	3.12	4.54	3.11
July	68.13	68.29	66.93	2.44	2.73	2.65
August	66.17	66.63	64.54	2.67	4.26	2.83
September	56.71	58.76	57.86	1.96	3.84	2.64
October	49.12	46.26	45.53	3.30	1.94	2.44
Average of August to October	57.33	57.22	55.98	7.93	10.04	7.91
Average of April to September	58.11	58.61	57.63	16.85	20.30	15.83
Average of January to October	44.84	46.17	45.09	27.92	28.45	26.55

From these figures it will be seen that we have had a peculiar season, one of extremes, but that on the whole the average of the ten months of the year has not been far from the average of the corresponding ten months of the twelve years, 1882-93. Taking the rainfall month by month we may state that we had a deficiency in March, a surplus in April and May, a deficiency in July, August and September, and a surplus again in October. This unequal distribution of our rainfall has resulted rather disastrously to

many of our crops as will be seen from the following table, which gives the acreage, total yield and yield per acre for our principal cereal, root and fodder crops:

Ontario Crops.		Acres.	Bushels.	Yield per acre.
Fall wheat	1893....	913,954	17,545,248	19.2
	1892....	966,522	20,492,497	21.2
	1882-93..	909,078	18,219,174	20.0
Spring wheat	1893....	356,721	4,186,063	11.7
	1892....	651,302	8,290,395	12.7
	1882-93..	553,624	8,442,203	15.2
Barley	1893....	467,315	9,806,088	21.0
	1892 ...	499,225	12,274,318	24.6
	1882-93..	699,916	17,964,493	25.7
Oats	1893....	1,936,644	58,584,529	30.3
	1892....	1,861,469	64,758,053	34.8
	1882-93..	1,702,513	58,954,051	34.6
Peas	1893....	738,741	14,168,955	19.2
	1892....	774,732	14,494,430	18.7
	1882-93..	683,591	13,979,163	20.4
Potatoes	1893 ...	142,601	12,911,212	90.5
	1892....	145,703	12,289,817	84.3
	1882-93..	153,566	17,800,655	115.9
Mangel-wurzels	1893....	21,519	8,582,568	399.
	1892....	22,026	10,350,474	470.
	1882-93..	19,917	8,692,833	436.
Carrots	1893....	9,288	2,971,450	320.
	1892 ...	9,941	3,827,361	385.
	1882-93..	10,289	3,616,023	351.
Turnips	1893 ...	136,604	56,975,355	417.
	1892....	129,627	63,541,641	490.
	1882-93..	109,638	45,860,817	418.
Corn for husking (in the ear)	1893....	217,294	14,072,951	64.8
	1892....	181,463	11,229,498	61.9
			Tons.	
Corn, for silo and fodder (green)	1893....	95,865	1,049,524	10.95
	1892....	91,403	948,907	10.38
Hay and clover	1893...	2,766,894	4,963,557	1.79
	1892 ...	2,515,367	4,384,838	1.74
	1882-93..	2,348,934	3,364,644	1.43

The great pasture crop does not enter into the above table. In 1893 the pasture land of Ontario was estimated at 2,682,180 acres or nearly 22 per cent. of the total cleared farm lands. The effect of the unequal distribution of rain would tend to increase the grass of early summer and decrease the grass of late summer. Now for the effect of this upon the flow of milk. The Ontario Department of Agriculture, in order to gather together the effects of the peculiar season, sent out to the cheese factories circulars asking for the figures as to milk and cheese month by month. I shall give here the results obtained up to the present time. Forty-three factories scattered over the province have

made returns complete enough to show us the general effect upon the cheese industr Here are the totals with a comparison of the total yield for 1892.

CHEESE STATISTICS FOR 43 FACTORIES IN 1893.

Month.	Milk used.	Cheese made.	Gross value of cheese.	Milk to 1 lb. cheese.	Value of cheese per lb.	Value of product of 100 lb. of milk.	Cheese made each month.
	lb.	lb.	$	lb.	c.	c.	per cent.
April	633,184	58,608	5,801	10.80	9.90	91.6	1.2
May	6,656,354	619,472	57,293	10.75	9.25	86.1	12.2
June	12,873,978	1,192,129	108,276	10.80	9.08	84.1	23.4
July	11,715,597	1,062,594	98,952	11.03	9.31	84.5	20.9
August	8,935,983	822,017	81,728	10.87	9.94	91.5	16.2
Sepremper	6,996,497	699,803	72,853	10 00	10.41	104.1	13.7
October	5,045,066	538,977	55,524	9.36	10.30	110.1	10.6
November	803,859	90,720	9,661	8.86	10 65	120.2	1.8
Total, 1893	53,660,578	5,034,320	490,088	10.55	9.64	91.3	100
Total, 1892	56,655,074	5,391,128	516,974	10.51	9.59	91.2	....

This table tells its own tale. The milk receipts at these factories were thirteen, twelve, nine and seven millon pounds for the months of June, July August, and September, a dropping off of six million pounds in the three months. This would indicate a dropping off of over 100,000,000 pounds of milk from June to September for the entire Province of Ontario, and a decrease in the season's output of over 5,000,000 pounds of cheese in comparison with that of 1892.

In the four months, June to September, then forty-three factories made 3,776,543 pounds which was just three-fourths of the entire season's make. If the production of June had been maintained for the remaining three months the total product for the four months would have been 4,768,516 pounds or just 1,000,000 pounds more than it was. These factories, therefore, lost about 1,000,000 pounds by being unable to sustain the June production, and the entire province thereby lost 17,000,000 pounds of cheese. The cheese industry has therefore during the past season suffered from a lack of milk, and the dairymen should face the difficulty. Whom are we to blame—the weather, the cows or the dairymen themselves? The weather certainly has given us short pastures after June, food has been short and the cows have demanded their usual supply for sustenance. The milk comes as a product only from the surplus food digested after the animal's wants have been supplied and a deficiency in food at once makes itself felt in the deficiency in the milk produced. Where is the remedy? Principally in this, that the dairymen must look ahead and provide for just such seasons as the past, poor pasture must be supplemented by soiling crops or silage. To corn, especially, must we look to help us control the weather. Take hold of it in a business manner and see to it that never again are you found in such a position. Come rain or come drouth you should be prepared to sustain the demands of the cows for succulent food in abundance.

It may be interesting to have the milk supply and cheese product of the factories individually for the four months. The factories, 1 to 18, are in the western half of the province, those from 19 to 43 are in the eastern half.

No.	Milk used.				Cheese made.			
	June.	July.	August.	Sept.	June.	July.	August.	Sept.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1	180,852	173,227	146,828	102,886	16,461	15,755	13,966	9,735
2	282,435	287,734	228,473	163,099	25,724	25,311	20,606	16,074
3	366,185	376,333	243,986	89,108	32,973	32,788	21,475	8,366
4	68,501	90,156	69,132	.....	6,290	7,970	6,068	.....
5	273,914	259,003	181,548	138,474	25,382	23,057	16,097	13,143
6	315,509	365,062	256,682	170,416	28,968	32,963	23,123	16,047
7	107,592	110,187	83,485	49,489	9,812	9,711	7,223	4,563
8	126,051	118,868	91,443	62,584	11,458	10,806	8,313	5,850
9	148,910	131,264	97,362	40,164	13,858	11,873	8,923	3,858
10	123,341	137,566	85,887	29,012	11,045	12,496	7,636	2,696
11	232,708	240,752	183,245	147,851	20,930	21,403	16,567	14,946
12	382,827	346,926	257,932	185,828	34,060	31,360	23,211	17,905
13	450,450	408,173	298,033	236,715	40,835	35,793	25,826	22,680
14	157,715	193,178	141,844	78,425	13,945	17,270	12,716	7,490
15	280,284	246,748	171,810	116,005	24,771	21,529	14,852	10,538
16	430,635	388,007	272,295	196,211	39,245	33,851	23,954	18,755
17	77,463	95,250	79,182	72,512	6,554	8,648	7,157	6,860
18	262,795	251,181	196,754	157,548	24,761	23,828	19,771	16,256
19	195,893	190,838	145,155	123,963	17,657	16,643	12,964	12,152
20	155,309	155,773	126,826	103,492	13,981	13,621	11,220	10,128
21	466,341	344,064	234,398	177,860	43,843	29,903	20,146	17,181
22	180,856	155,653	105,317	86,779	17,181	15,002	10,106	8,878
23	572,381	546,453	386,332	322,110	54,750	50,195	36,174	34,090
24	651,226	560,129	387,452	296,694	61,621	51,797	35,960	30,933
25	369,643	308,662	211,038	173,521	35,216	28,380	18,838	17,398
26	425,765	386,442	299,115	261,790	41,806	36,971	28,754	26,988
27	348,326	309,859	223,255	205,540	32,571	28,367	20,669	21,230
28	146,481	128,380	97,702	94,069	13,668	11,808	8,930	9,119
29	306,083	271,034	207,196	194,154	28,870	24,409	19,018	19,378
30	219,793	189,095	145,731	123,328	20,207	17,489	13,721	12,543
31	433,844	370,660	273,601	259,547	39,913	34,276	25,225	25,847
32	696,621	610,496	498,115	419,425	64,600	57,292	48,039	45,670
33	310,537	234,309	226,214	174,758	28,904	22,789	21,026	17,133
34	257,128	214,878	154,689	152,823	23,344	18,914	13,976	15,414
35	229,341	204,209	158,238	158,287	21,617	18,605	14,415	15,755
36	318,153	203,128	251,189	188,702	30,054	20,058	23,811	19,022
37	422,247	343,680	326,637	291,175	40,529	33,264	31,227	29,795
38	291,450	292,630	262,431	232,457	26,887	24,212	27,190	23,267
39	339,064	334,430	277,379	244,028	30,839	30,159	25,684	24,618
40	265,850	247,911	197,872	151,192	23,762	22,295	17,886	15,106
41	241,848	224,222	169,576	131,798	22,084	20,397	15,463	12,993
42	441,846	368,302	252,667	208,528	42,184	32,842	23,030	21,050
43	319,785	294,445	231,967	184,150	29,169	26,494	21,051	18,353
1 to 18 west	4,268,167	4,219,615	3,085,92	2,036,327	387,072	376,412	277,484	195,762
19 to 43 east	8,605,811	7,495,982	5,850,062	4,960,170	805,057	686,182	544,533	504,041
1 to 43	12.873,978	11,715,597	8,935,983	6,996,497	1,192,129	1,062,594	822,017	699,803

From the totals it will be seen that the western factories held their own better in July than the eastern, that all fell off in August, and the western fell off in September more than the eastern. The lesson taught by these figures plainly is that the dairymen of Ontario, East and West, are sure to lose heavily in a dry season unless they plan beforehand to have a reserve crop of rich, succulent food to take the place of the grass. The loss to the province can be represented only by millions of pounds of cheese and even millions of dollars. It is the duty of of dairymen to meet the difficulty, and the only way to do so is for each dairyman to meet the difficulty for himself. Forewarned should mean forearmed Let every dairyman do his duty, Ontario expects it, and the times demand it.

FODDER CORN: ITS VALUE, GROWTH AND PRESERVATION.

Mr. Frank T. Shutt, M.A., Chief Chemist, Dominion Experimental Farms, delivered the following address, illustrating his remarks by large charts: After the interval of another year we are again called together to discuss matters relating to the dairying industry, to exchange experiences, to tell of our successes and our failures, and by this co-operation furnish information which we may put into practice during the coming year to our mutual benefit and the development of this branch of agriculture. This, I take it, is the function of the Dairymen's Association; these, I feel sure, are the objects and aims of our annual Convention.

We hear a good deal nowadays about the necessity of organization among farmers—and this as a matter of course includes dairymen, since all farmers are or ought to be to a certain extent dairymen, the agents directing the conversion of the plant food in the soil into flesh and milk. I quite agree with this sentiment, but I fear that very often too many of us mistake the kind of organization and association that best conduces to our financial interests.

Conventions such as this should prove of inestimable benefit to those who are able to attend. Valuable as are the reports of our proceedings to all who carefully read them, doubly valuable should our discussions be to all who hear and take part in them. Opportunities of learning much of the work carried on and the results obtained at the Government institutions are afforded; difficulties which have obstructed the path of progress of our members may be cleared up and in a host of ways help given to all. Practice and science join hands in the endeavor to make these conventions as helpful and valuable as possible. And if I might offer a suggestion as to how, in my opinion, these meetings might be made more useful than they have hitherto been, it would be by urging a fuller discussion upon the subjects of the addresses. Too often those upon the programme do all the talking and the other members of the Association do nothing but listen. This is not as it should be. Farmers and dairymen every year and everywhere over this Dominion are becoming more and more observant and are realizing how necessary it is to take an intelligent interest in their work, and this being so it is obvious that accounts of individual experiences must be of immense value to others who have to meet and overcome the same difficulties. Let us, therefore, have a truer, heartier co-operation, then, in the work of this Convention; let us remember that the privileges of the Association are alike for all members whether they be on the platform or in the audience. I trust that at the close of the few remarks I am about to make that we shall hear from many of our friends present. I, for my part, will be happy to give such further information as I may be able to, trusting that in the end we may all be edified and instructed.

When I received the invitation from your Committee to be present to day—an invitation I was very glad to be able to accept—it was accompanied by a request that I should address you upon the subject of fodder corn. If I had been allowed to choose my own subject I think I should have selected another, for as I spoke on corn two years ago at a similar convention, I fear some of you may think it an old story. Under the circumstances I shall console myself that old stories are as a rule good stories.

The growth of corn as a fodder has perhaps been more instrumental than any other one factor in the development of the dairying industry that has taken place during the past few years. We have heard in the address of the speaker that immediately preceded me how necessary it is for the farmer to use all the means at his command for controlling the weather—not directly, but indirectly—by drainage, by thorough cultivation, by growing soiling crops, so that in seasons of drouth the feed of the dried-up pastures may be supplemented by succulent fodder, and in many other ways. I know of no crop that stands the equal of Indian corn—all things considered—for this latter purpose. The farmer who is supplying milk to a factory is rendered practically independent of such adverse seasons if he has a good-sized patch of Indian corn, and I have no doubt there are those present who could give testimony as to the good results in keeping up the milk flow by feeding this fodder during the months of August and September, when, owing to lack of rain the pastures, have become dried up.

Winter dairying has not only been made possible, but proved to be a success in Ontario, and chiefly so because corn and corn ensilage furnishes a palatable and succulent food that keeps up the flow of milk during the winter months.

Of all the coarse or bulky fodders corn gives us the largest amount of real cattle food per acre. The figures to prove this you will find in the report of this Association for 1891. They were deduced from careful field experiments and analyses made at the Central Experimental Farm. Moreover, the corn crop is one that can be produced cheaply—it is more or less a sure crop, it is one that cleans the land—all very important matters. These are among the chief reasons why I so warmly recommend the growth of Indian corn to all who keep cows.

There are two classes of fodders used upon the farm. The first may be termed "concentrated fodders," including the various grains—wheat, oats, barley, rye, peas, cornmeal—as well as certain milling and by-products, such as linseed and cottonseed cake, bran, etc. They receive the name concentrated because they contain a large percentage of albuminoids—the most valuable of all food constituents. A certain quantity of albuminoids daily are essential to the animal. Their function in animal economy is largely toward the formation of flesh and the production of milk. But while these concentrated fodders are so valuable and important and indispensible, they can only form a part of any well balanced ration. Why is this? In the first place they are very expensive, and being fed exclusively would really mean in excess of the wants of the animal, and therefore a financial loss. And secondly, and none the less important, their too liberal use would result in derangement of the animal's digestion.

The second class are known as "coarse or bulky fodders," and comprise grass, clover, fodder corn (green and dry) straw, as well as roots of all kinds. They are characterized by containing, as a rule, more starch or sugar fibre and water and less albuminoids than the preceding class. The digestive apparatus of the ruminant requires that a certain amount of these coarse fodders be fed daily. The stomach of the cow must be distended to a certain extent if she is to keep in good health. Without such there is not a normal flow of the digestive secretions. The more costly and concentrated fodders must therefore be diluted, as it were, with a coarse, less strong fodder. A mixed diet is best for the cow, and what is best for the cow is best for the man who keeps her.

On the other hand it must be remembered that there are very few of the coarse fodders that possess a sufficiently high percentage of albuminoids to allow them to be used exclusively. Too large a quantity would have to be consumed in order that the animal obtain the requisite amount of albuminoids.

All these statements are corroborated alike by chemistry and physiology on the one hand, and by practical and economic feeding on the other. Rational feeding shows the relative value of these two classes of fodder, how both are indispensible, and how neither should be used exclusively to obtain the least results.

Fodder corn claims a first place in the list of coarse fodders. Let me reiterate the reasons why it should do so. It is palatable and succulent; it is produced cheaply and yields a large crop per acre; it cleans the land, improving its tilth, and is more or less of the nature of a sure crop.

Succulent foods, such as fresh grass, roots, and corn fodder, are particularly favorable to a good yield of milk. Corn well preserved in the silo affords such food. Good ensilage is a healthy food, such as is palatable to and relished by cattle. When fed on it at the rate of 40 pounds to 50 pounds daily, with a little hay or staw and 3 to 5 pounds of one of the concentrated fodders already alluded to, milch cows do well and give excellent milkings, both as to quantity and quality.

It is a cheap crop, producing a very large yield of real cattle food per acre. By experiments very carefully conducted in the field and in the laboratory it has been proved that in feeding value 4 tons of good corn ensilage are equal to 1 ton of good timothy hay. If we do not allow the corn to come to the glazing condition before cutting, or we allow the timothy to become dead ripe before mowing, this relative value does not hold good. The quality of both these fodders is largely dependent upon cutting them at the right time and preserving them properly. Now, we may take as fair average yields per acre 2 tons of hay and 16 tons of fodder corn. If this relative yield be true, and I

think it is, as near as we can get it, then we obtain twice the weight of real cattle food from corn per acre that we do from timothy. At the Central Farm our corn costs in the silo about $1.50 per ton, but even if we put the cost of good ensilage at $2 per ton there will be a very large balance in favor of the corn crop over that of timothy. I ask you to take the facts here presented to you into your thoughtful consideration. I feel sure that you will find that they fully corroborate my statement made regarding the value of corn fodder and ensilage to dairymen.

Corn should *not* be sown broadcast, for such a practice will result in a crop inferior both as to quality and quantity. The corn plant requires plenty of room for its roots, and, above all, plenty of room for its development above ground. Unless the sun can get at it on all sides it cannot take its food from the atmosphere as it should. Robust growth and maturity are only obtained under the latter conditions.

Plant them in rows or in hills. The rows may be 3 feet or 3½ feet apart, and not too thickly. Eighteen to twenty pounds of seed to the acre is sufficient. Planting should not take place until danger from spring frosts is over, as the young plant is very tender.

Previously prepare the ground well, and manure it liberally For this latter good barnyard manure and wood ashes will be found to give excellent results.

When the corn is up, cultivate thoroughly. This will keep the plants free from choking weeds, and preserves the moisture in the soil for the roots of the corn to take up.

Plant varieties, such as Compton's Early, Longfellow, and Pierce's Prolific, that will come to the glazing stage before danger of autumnal frosts. I showed very conclusively, two years ago, that there resulted a great loss of cattle food if the crop were cut before it arrived at this condition—a loss varying from 50 per cent. to 100 per cent. Besides this loss we must also remember that corn cut earlier than this stage does not give good ensilage—it will be watery and very acid. Allow the corn then to glaze before cutting.

It may be cured by drying in stooks or preserved in the silo. I recommend the latter course, since it gives us a succulent feed, so necessary for cows in the winter months.

The silo, if properly constructed, will preserve corn cut at the right stage in excellent condition. The whole secret lies *in the exclusion of air*. Do all you can toward this end, and you will have good ensilage. It is the presence of air that causes fermentation, and fermentation results in the production of acid. We wish to prevent this and to preserve the corn in the same condition it is in when taken from the field, as far as may be possible.

In conclusion, gentlemen, let me urge you, if you wish to become more prosperous dairymen, to grow corn, for it means more cattle, a larger production of flesh and milk, and an increased fertility of the soil since by feeding the crops upon the farm the plant food for the most part is retained for succeeding crops.

At our next convention I trust there will be many present who will be able to give testimony as to the good results obtained from putting into practice what we have learnt this morning regarding the growth and use of fodder corn.

A MODERN INSTANCE

Prof. ROBERTSON, Dominion Dairy Commissioner, said: While listening to those addresses this morning I thought I might read to you a brief extract I found among the reports sent us, and which will perhaps give emphasis to the point made by Prof. James, when he spoke of the possibility of the farmer preventing injury to himself from unfavorable weather or climatic conditions. The very great loss experienced by dairymen during the past summer came from dry weather, short feed, scarcity of verdure, and plentifulness of flies. In getting reports from some of the leading farmers

of Canada on their experience in growing a mixture of corn, beans, and sunflowers a number of them furnished some excellent information. Mr. E. D. Tillson, of Tilsonburg, a leading dairyman of Western Ontario, wrote as follows:

"We had the most severe drouth in this section I ever knew. I planted 26 acres of M.S.S. corn one-half on dry, sandy soil, and one-half on clay loam. All came up and grew well till the 1st of July. It was as fine a crop up to that time as I ever had, particularly on the sandy soil. Never did corn get a finer start, but during the month of August and the last half of July we had no rain. It was so hot that the corn wilted, and on the sand dried up, so that on the dry, sandy soil I had only a quarter of a crop—say 5 tons per acre—and on the damp, clay loam soil had three-quarters of an average crop or 15 tons per acre, so that, on the whole, I had about half a crop. I usually get 20 tons to the acre, and some seasons more. I have 200 tons of old ensilage left over from last year, so that I shall have plenty of feed for the coming year. I have been feeding my 40 cows on ensilage all summer. During the months of July and August our pastures about here were completely burnt up, but, with my old last year's ensilage, I managed to keep my cows in good condition, with but little falling off in milk, and that was caused more by horn-flies than from want of feed. It was a fortunate thing that I happened to have an over-stock of ensilage from last year.

Now, if every dairyman in Ontario had such an overstock from the previous year there would be no such shrinkage to report, as we have heard of 2,000,000 pound of milk in 47 factories from June to September. By having ensilage the dairyman may protect his cows from the horn-fly by keeping his animals in a stable when the flies are around. If you cannot do anything else you may at least sprinkle the cows with a weak mixture of coal oil, and turn them out in the evening when the flies are not so bad. This dairyman with 40 cows had but little shrinkage in his milk supply. It also shows the value of our statistics. I shall not speak upon what Mr. Shutt has said, but I expect to have some samples of our ensilage—corn, beans, and sunflowers—this afternoon for inspection.

A pail containing samples of this ensilage was exhibited during the afternoon, and caused considerable interest and comment.

CHEESE MAKING.

Prof. J. W. ROBERTSON was again called upon, and after a few introductory remarks said: In speaking of cheesemaking I will first of all go back to the fundamental principles that every cheesemaker should know and state that cheese is composed of three main constituents—fat, casein or curd and water. There are several other substances, but the three I have named are the chief ones. The ordinary cheesemaker loses no larger a percentage of the fat in the whey from the richest of milk than from the poorest. It is a fallacy to suppose that the fat in the rich milk that goes to the factory will be in the whey that comes home to you. Let no dairyman refrain from sending the richest milk to the factory from that fear. There will be losses of fat, but they will not depend upon the richness of the milk, but upon the treatment the milk undergoes while in the maker's hands. The condition of the casein in milk and cheese is more important than its quantity; and its condition depends largely upon the aeration of the milk. By the aeration of the milk the elements which alter the condition of the casein, and so greatly influence the quality of the cheese, will be introduced. The aeration of milk is not merely to eliminate out of the milk the odors that the cow or her surroundings have left there, but also to induce fermentation of a proper sort. As yeast is put into bread batter in order to get the proper 'rising,' so in aeration of milk, the ferments which cure the cheese are taken in. One can not get bread that is light and palatable, without putting in yeast, nor can one get first-class cheese without getting in those germs of fermentation by aeration. The condition of the casein is important, and so is the quantity of moisture that the maker can retain in his cheese. The wise cheesemaker will so manipulate the curd that it will retain a fair amount of water in the cheese. The less water there is in cheese, the drier it will be, and usually the harder it will be. Dryness and hardness are not admirable qualities in a cheese. Men who use cheese like to eat an article that is rich and tender and not one that is dry and tough. If too much water be left in the cheese, one runs the risk of getting the casein in bad condition, and

the cheese will decompose quickly and spoil. All ripening and decay in cheese is owing to decomposition by fermentation. If too much whey be retained in the cheese, or if any foul milk be used, the cheese will go off flavor quickly. If all the fat of the milk be retained in the cheese and the casein become plastic and soluble, the finest quality and largest quantity of cheese that can be made from a given quantity of milk will be obtained. In the ripening of milk at cheese factories the tendency is for the cheesemaker to ripen the milk too much. They are disposed to leave it too long exposed to the atmosphere of the factory, which is not often a good atmosphere for milk. The maker should not ripen the milk beyond the stage known by the cup or rennet-test as 20 seconds. If he ripens his milk beyond that, he runs the risk of having the texture of the cheese injured and of having a bad flavor. Some cheesemakers think that by delaying the setting of the milk until it is very ripe, they will get a firm curd and better coagulation. A very desirable means of getting this condition, however, is to use a sufficiently large quantity of rennet to coagulate the milk quickly. The rennet does not cure the cheese any more than the bandage does, except as it retains a larger percentage of water. Fermentation always goes on faster in a moist substance than in a comparatively dry one, and therefore it is well to have a fair amount of moisture in the curd. If the cheesemaker will heat the curd in the vat very rapidly, he will find that the surface of the particles of curd acquire a peculiar toughness which does not exist in the interior of the several pieces. If the curd be caused to retain too much moisture, when that kind of cheese is five weeks old, it will spoil instead of getting a richer body and flavor. If the maker will cut the curd into small pieces and stir them most carefully he will have a uniform consistency of casein and have the cheese rich when young and richer when old. As a rule it is no gain to have the curd heated above 98° Fahr. If the cheesemaker has a curd of good quality and will heat it slowly he will have a better cheese from heating it to say 98° than higher. In many factories there are not yet conveniences for keeping the curd warm after it is dipped. It will there pay the cheesemaker to retain the warmth by heating it just before dipping to perhaps 102°.

It is not safe for the cheesemaker to remove the whey from the curd, or the curd from the whey, until he is able to discern the presence of acid by the hot iron test. All the odors will be misleading ; and I would have the maker use the hot iron test every day. It is just here that many cheesemakers fail to do the best work for themselves and their patrons. They dip the curd at this stage, let it get dry and cool, and then, especially in the fall of the year, linger around the factory for no other object as far as I can see except to put in time until ten or eleven o'clock p.m. I do not see why the cheesemaker should not always, or with a very few exceptions, get through his work at six o'clock. Here seems to be the particular trouble. The curd is working slowly, and so the cheesemaker lets it cool down to 93° or 94° ; and after a while he may allow it to cool down to 90°, which feels warm to his hands in October. It will take a curd at 90° three hours to make as much progress towards ripeness for salting, as it would make in three-quarters of an hour at 98°. There you have a difference of two hours and a quarter, and the cheese will be better by the quicker development of acid. It makes all the difference between that most disagreeable task of the cheesemaker having to go down to the factory with a lantern to bandage the cheese at ten o'clock and of getting through with the day's work before six. A good many cheesemakers have been getting useful hints from the dairy bulletins issued from time to time by the Governments, but I fear that some do not read them with sufficient care. They may perhaps read them carefully in the spring, but they do not read them so closely as the months go on. If a cheesemaker would take our bulletins for a whole season and watch these minor changes from month to month as we recommend, he would find valuable guidance in detail.

After the details of cheesemaking are finished—that is so far as handling the curd is concerned—makers should still endeavor to improve them so far as the workmanship and finish of the cheese are concerned. There was no object lesson in the cheese at Chicago last June so impressive as the marked difference between the appearance of those from Canada and those from the United States. The Canadians were very far ahead, but I must confess that some of our cheese were not equal in appearance to the best of their cheese. I could have picked out cheese from thirty factories that were altogether dif-

ferent from the other cheese shown there. More than 30 per cent. of the cheese we sent to the Columbian Exhibition lost to some extent on the shape and finish of the goods. Why should they lack fine appearance? I would polish and finish the rind of an exhibition cheese if I had to do so by borrowing an iron from the lady next door or from the woman who puts the gloss on my collars. We need to have our cheese more uniformly large. Make them to weigh seventy or seventy-five pounds, and thus you will please the buyer and the English merchant better. Of course a few thirty pound cheese may be made. I would suggest that cheesemakers brand on the side of every cheese with a neat stencil, in letters not over half an inch in size, the single word "Canadian." This could be done as he takes the cheese from the hoops or when he marks the day of the month. It would be a good thing if every cheese turned out was neatly branded in this fashion. The people in England are asking for Canadian cheese, and I think it is worth something to have the name on every cheese sent out.

Mr. WHITTON: Have you had much experience with greasy or oily curd? The curd often became oily, so that when the cheese came from the press the bandage was quite greasy. This has been bothering a good number of our cheesemakers.

Prof. ROBERTSON: The trouble complained of is a serious one, and it is one of the most difficult to explain and correct in my cheesemaking experience. Sometimes the curd gets an oily and greasy condition from the use of too little rennet, but that does not often show in the press. But the condition referred to by Mr. Whitton comes largely from the temperature of the curd being maintained too high after the acid becomes developed to three-quarters of an inch by the hot iron test. The curd should be allowed to become gradually cool after three-quarters of an inch is thus shown at a temperature not over 90° and then be milled.

Mr. S. R. PAYNE: Do you think that jarring a vat after setting or coagulation would have any effect in producing that greasy condition?

Prof. ROBERTSON: I do not think it would so far as the condition in the press is concerned, but it might affect the greasy condition in the vat.

Mr. WHITTON: I think Prof. Robertson has struck the nail on the head. Too many of our young cheese-makers start the curd in the vat when too warm. It is better to allow it to cool down. Can Prof. Robertson give us any hint as to how to return patrons three pails of whey for every pail of milk? (Laughter).

(Prof. Robertson smilingly looks in the direction of Mr. Derbyshire, and that gentleman rises to the occasion with a very merry twinkle in his eye).

Mr. DERBYSHIRE: Sixteen or seventeen years ago we had that difficulty in the Plum Hollow factory. I sat up at nights thinking out the problem. Up on the hill we had a fine spring, and had a connection between the factory and the spring. As I said, this matter of furnishing a large amount of whey was the difficulty at the factory just then. So I conceived the idea of uniting those two great elements, whey and water, and by a judicious arrangement of pump logs I could permit a flow of spring water into the whey tank. (Laughter). This gave every one of them all the whey they wanted, and they all went home with full cans and smiles on their faces. (Renewed laughter.) One of the farmers who had been complaining most bitterly came to me and said: "My potash kettle is full, but my pigs won't drink it; and the strangest thing is that the young mosquitoes can be seen at the bottom of the cans." (Laughter.) I told him that my cheese-maker must be getting too much cheese out of the milk. I had finally to remedy the matter by not turning on the water tap so much, and by letting every man have just the amount of whey he was entitled to. (Laughter and applause).

Mr. PAYNE: Will the evaporation from the sample bottle affect the test? Some bottles are not sufficiently stopped.

Prof. SHUTT: These bottles should be well stopped or corked.

Mr. RUDDICK: I think that in a cheese-factory where the atmosphere is laden with moisture there would be very little evaporation.

Mr A. E HORSLEY: Is there any plan of taking all the cheese out of the milk—that is, so that there would be no waste of butter-fat in the whey?

Prof ROBERTSON: No means are now practicable. In order to obtain all the butter-fat you would have to use instruments so fine and delicate that the result would not pay for the extra work and expense. We must expect to lose a little amount. We find that at present we lose an average of about eight per cent. of all the fat, or say four or four and a half ounces of fat for every 100 pounds of milk.

Mr. HORSLEY: Does all the cream that rises go out in the cheese?

Prof. ROBERTSON: There is just as large a percentage of fat lost from perfectly new milk as from milk that is twelve or twenty-four hours old, with this difference: If the fat comes to the top, and acquires a leathery condition of cream, those little clots are lost, but if not, there is just as much fat retained in the cheese.

Mr R. S. PARKS: Can whey be sweetened and sent home in milk cans, and the factory be run in a satisfactory manner? Please explain how it can be managed.

Prof. ROBERTSON: It is not yet practicable to heat whey high enough to sterilize it and have it cooled before returning it to patrons. If it be left at the high temperature of 150° or 160°, the long period at which it continues above 100° will cause it to become more intensely sour before it is consumed on the farm than if it where run into the whey tank at the usual cheese-making temperature of about 98° and sent home in that condition.

DAIRY REPORTS FOR FACTORIES.

The following resolution, moved by Mr. ALEX. W. GRANT, and seconded by Mr. R. G. Murphy, was read, and carried without discussion:

"That the Provincial Ministers of Agriculture of Ontario and Quebec be requested to furnish each proprietor of a cheese factory with forty reports of dairy associations, thus placing in the hands of makers and patrons of each factory the proper instructions for carrying on their work successfully."

The Convention then adjourned until the afternoon.

SECOND DAY—AFTERNOON SESSION.

The President took the chair at 1.30. A large attendance was observed at this session of the Convention, and close attention was given to the business of the day.

ELECTION OF OFFICERS.

The report of the Nominating Committee was read and adopted without change For list of officers, etc., see page 2.

CHEESE-MAKING AS AN OCCUPATION.

Mr. W. W. GRANT, of Lakefield, read the following paper: The earliest impulse of man led him to reach after food for his daily subsistence. In agriculture, up to a few years previous to the present time, his ingenuity had been exerted in increasing the power of producing from the soil the material aids for his physical comfort by almost continual and exclusive grain growing till the fertility of the soil had become so depleted as to render profit very small, therefore he has been compelled to turn his attention in another direction, which has developed into the great dairy industry, the principal branch of which is the cheese business, and this has given us the occupation of cheese-making, one which requires considerable skill, and there is a constantly growing demand for more skill.

The vocation of the cheese-maker is to convert the raw material (milk) into food in the best possible form for consumption and transportation. In the present day when dairying is of such importance to our country, a man who is engaged in the manufacture of cheese cannot but feel that his work is of value, full of dignity, and that he is a felt power in his community; and, prompted by such motives, he will work more faithfully, and be a better man. Still, from some of the environments which surround a man in his work, he is frequently handicapped, and his occupation is often uncertain and precarious. Some of these drawbacks are the farmer's lack of sound dairy knowledge, his unprofitable cow, which would not be profitable even if intelligently fed and cared for and too little attention given to the care of the milk. In judging cheese in competition about fifty per cent. is given for flavor, the remaining fifty per cent. for body, grain, texture, color, finish. So it is plain to be seen that fifty per cent. of a fine cheese is obtained by the patron who furnishes the milk, by caring well for his cows, observing that they get nothing but wholesome food and pure water, and giving the best possible attention to the care of his milk. The cheese-maker puts the other fifty per cent. skill to it, and the result of the combination is a first class article. Too often the patron furnishes say about ten per cent., and the maker is expected to make up the other ninety per cent. There are few factories but which have some of these ten per cent. fellows, and only a few injure the milk of all the rest. I will venture to say that there are not many of these ten per cent. patrons here. You could not get them here, for they think they know it all now.

Then again, a man is often placed in a factory where the equipments are anything but adequate to make the work a success, and still he is expected to make fine goods under the circumstances. There is also the blind policy of farmers supporting a large number of factories within a small radius, which tends greatly to increase working expenses and the profits of the manufacturer are cut down to the lowest fraction. Such then are some of the environments of the occupation which may be called adversities.

The storms of the ocean, rouse the faculties and excite the invention, prudence, skill and fortitude of the voyager. So with a cheese-maker. When he is confronted with the adverse conditions of his work he should, as it were, rouse himself and become fitted to meet them.

Although the various experimental stations and the literature they send out, the Dairy Associations and their means of instruction, are all doing a great good, still it is difficult to reach a great number of the farmers—"the ten per cent. ones." They, as it were, stand back and are difficult to reach; but the cheese-maker who is almost continually in touch with his patrons may be a great means of help in the work. If he is an enthusiast in his occupation he will endeavor to master every detail in connection with his calling, and they are many. In fact the necessities of the dairy business demand that if a man wishes to make himself successful he must be as well versed in modern progressive dairy science as the chemist is in chemistry, and the means whereby he can become so are obtainable if he will only patiently observe them. The mechanical act of making cheese from day to day is not the only attainment a cheese-maker should have. He should be able to tell his patrons something about breeding the "special purpose" dairy cow, the one that will produce the greatest number of pounds of butter-fat at the least possible cost, the kind of feed he should give that cow, the effect of food on milk, and how the milk should be cared for after it leaves the cow. I believe if we could learn all the causes of bad milk we would find out that about ninety-five out of one hundred occurred after the milk had been taken from the cow. Thousands of dollars have been lost and the reputations of good makers ruined by trouble arising from tainted milk. I know makers who have had to give up the work because they could not stand the anxiety; and from personal experience and observation I can safely say that tainted milk causes the average cheese-maker more worry and vexation of spirit than any other circumstance connected with the work. Such, then, being the case it behooves every maker to make special study of milk fermentations and their relations to dairying. I do not mean to say that in every case tainted milk is due to carelessness and neglect. In a great many instances it is being ignorant of the causes which produce such milk, therefore it is the duty of the maker to

instruct and enlighten his patrons by frequent talks on this point, and leave no one a chance to plead ignorance as an excuse for bad milk. They should know that no dairyman can afford to send such milk to the factory.

If all persuasion fails to make the patron take proper care of his milk, then the maker should promptly reject it when offered—that is if he can detect it. An experienced man can generally do this unless the milk is cooled below 60°, then it may be somewhat difficult. I will give an instance of how I discovered the cause of a tainted curd. Last spring, when the weather was cool, I had one day a curd which we, makers, call a stinker, I made up my mind that I would find out the cause next day, but my closest scrutiny at the weigh was baffled. On the following day I was more determined than ever to find it, and having a number of extra pint bottles on hand, as we paid for milk on the test plan, I put a cupful of each patron's milk which went in this particular vat, into some of these bottles, and while doing so I could detect nothing wrong, but when the curd was heated up there was the same bad taint. About four o'clock in the afternoon I went to examine the samples in the bottles, and it was not long till I found the same odor as the curd had. I went to that man's place after I got done my day's work, found that the milk had been kept in the barn yard, had it removed, and the next day there was no taint on the curd. So the question is not so much how shall we handle tainted milk, but how shall we get rid of it?

Formerly it was thought that the skill of the maker should be centered on the hopeless task of converting this damaged milk into good cheese. Now the practical idea prevails of having damage prevented at the patrons' homes. So one of the important qualifications of a maker is to have a thorough knowledge of the care of milk.

He should also be well informed as regards the Babcock test and the different methods of taking composite samples for the test, and mathematician enough to divide the money in correct proportion as based on the butter-fat delivered by each patron, keep himself well posted on all the modern methods of making, study well the process of curing—this in itself is an interesting study; how the different temperatnres and different degrees of moisture in the curing-room affect the ripening process; and now that winter dairying has got a foothold in our country, and will no doubt still continue to grow, as farmers are beginning to realize that to make dairying profitable they must milk the cow longer than six or seven months.

Mr. Grant closed by telling the story of a city fellow who went out to see his sweetheart milk a cow. After watching her a while he ejaculated, "Why, is that the way you milk a cow? I thought all you had to do was just to pump her tail up and down and get all the milk you wanted." There should be no connection between the cow and the pump.

PROF. DEAN: I would like to have heard from those who have been paying by test in Eastern Ontario. We have two or three men here who have been practising that system. The system of paying by fat should be done at the least possible cost of time and trouble. I think it is possible to take samples that will keep for one month, and the results will be as satisfactory as the samples taken for one week.

WINTER DAIRYING.

Prof. J. W. ROBERTSON delivered an address on the above subject containing many useful hints, a report of which will be found in the proceedings of the Creameries' Convention at Belleville, where the same topic was handled by the speaker.

Mr. DERBYSHIRE: It is three years ago since Prof. Robertson, at Brockville, advocated winter dairying before our Association. We then thought that anything the professor stated ought to be correct, and so we at once set to work to put into practice the truths taught us. We began the next year by the first of November to see what we could do regarding this winter dairying process. One of these factories we started at Elgin. Mr. Murphy, who is a director of this Association and the leading spirit in the control of that factory, is here. This past year they continued to make cheese until the 15th of November, but since that date they have made about $4,000 worth of butter. I believe that Prof. Robertson said the truth to-day when he told us that

we should look carefully into the cheese-making business and not overdo it. However, I am not one of those who believe we can overdo the cheese trade if we only run it on the best principles. When Prof. Robertson first advocated winter dairying some of our cheese-makers arose and almost took their rifles in their hands to shoot him for advocating butter-making in the Brockville district. (Laughter.) You all know Brockville is the natural home of the cheese industry. (Renewed laughter.) You may laugh, but at Chicago the man who scored the highest points for his cheese was from the Brockville section. We not only licked the United States, but also the western part of the Province. (Laughter and applause.) The additional revenue from winter butter-making has been of great assistance to the farmers of the vicinity of Elgin. If the cans had been allowed to go dry the greater part of that $4,000 would have been practically lost. I would advise you when you go home to put the truths you have heard this afternoon into practice. Take some locality where a factory is centrally located, and put in a separator churn, and all the apparatus for making fancy butter. Get a separator put in a neighboring factory, say six miles away, but do not put in a churn—let this second factory be a skimming station. Give the cheesemaker there something to do to keep him from idleness, and send the cream to the central factory to be turned into fancy butter. In this way four or five factories could act as feeders to a central establishment where the united cream could be churned, and the butter be distributed from the one centre. The farmer could get his skim-milk from his local factory and feed it to his pigs just as if he had brought it direct from the central factory. Such a plan of butter-making will give us better butter, and we will soon get a national reputation for our winter butter. In the winter we do not need refrigerator cars. We have made the finest butter at the Elgin Model factory that has been made in Canada this year. I have sent it to every part of this Dominion, and I have also sent it to friends in the United States, who have paid the duty and they have written to me to say that the butter is absolute perfection. The laws the professor has laid down to-day are laws which if obeyed will bring us prosperity. A friend of mine recently said to me, "When you put a separator into a cheese factory you will soon find the manager skimming the milk and making a skim cheese." We are not advocating that, and we are not afraid of that sort of thing being done. In the Elgin factory the boiler is at the end of the factory, and all the apparatus is worked up through the factory. We put up another building adjoining the cheese factory, and make the one boiler work the cheese room on the one side and the creamery on the other. I repeat that every dairy section of Ontario should have $4,000 in the winter as well as the locality known as the dairy neighborhood. But this means that there must be better stables, and that we must give our cows better care, and give closer attention to the feed of the stock. Such a condition of affairs is possible wherever an honest desire to attain it is put forth.

OUR HOME MARKET.

Mr. C. C. James, Deputy-Minister of Agriculture, said: In making a few closing remarks I cannot too strongly emphasize the advantages of a home market for our cheese. There is an old proverb that "The shoemaker's child must go without shoes," and as a rule Canadians seldom eat good cheese, notwithstanding the fact that we produce so much. Prof. Robertson thinks that there is danger of overdoing the foreign market. Our chief competitor for the British market in the exportation of cheese is the United States, but while Canada has been gaining in her export of cheese, our neighbor has been losing to the same extent. The home market for cheese has been increasing in the United States, while the foreign market has been opening up more and more to us. The figures for the part ten years will show a decrease in the shipment of American dairy produce. Now, just a word or two in regard to the home market. About two years ago I sent to a friend of mine in the western part of the province and ordered a home made cheese. It cost about eleven cents a pound and was divided among friends of mine who desired a first-class article. They ate it with a relish and never thought that such cheese could be

made in this province. They had been accustomed to eat foreign cheese—Stiltons and other highly praised sorts. That Canadian cheese I bought, however, was well ripened and came on the table in the condition our cheese generally goes to the British consumer. Our Canadian cheese generally comes to us in too green a condition; and so the local taste is not properly catered to. If by some means or other we could cultivate the home market in this line we would soon develop a large trade. We have also some difficulty in getting first-class butter, more especially in our city trade. Last summer I wanted some good butter, and a few of my friends also desired some. One family said they wanted 150 lb.—three tubs of 50 lb. each. I procured some butter from Mr. Derbyshire for that family, and the butter was going to last them the whole year. It was got early in September, but last week I was told, "That butter is nearly all gone; can't you get me more like it?" (Applause.) They sent for another 100 lb., and I think that 250 lb. of butter will hardly last them through the winter. Another gentleman met me in October and asked me where he could get some good butter. I told him to go to a certain dealer. A week or two ago he came to me again and said, "I got that butter and will need more and my son will need more." Put good butter before a city man, and he will buy it even if it costs more, and he knows that he will use more of it than of an inferior article. First-class butter can always find a ready and a lucrative market. My contention is that while looking well to the foreign market we must not neglect our local trade. We have a good market here for cheese, but Canadians do not get our cheese in its choicest form, and therefore there is a little prejudice against it. Too often we have to put up with the culls while the old country market is supplied with the best. A friend came to me a few weeks ago and said, "Where can I get good butter?" I replied, "You can easily get it, but it will cost you 26 or 27 cents a pound." His face changed, but I continued, "That will be first-class creamery butter." "Well," he said, "I am willing to pay that, for I have been paying as much at the store sometimes, and it has not been first class butter either." You will see, then, that there is a demand just here at home for the best butter that can be produced, and there is a large home market also for our cheese if the article is put before them not in a green or raw or undeveloped condition but is ripe, wholesome and appetising.

REPORT OF COMMITTEE ON DAIRY UTENSILS.

Mr. MacEwan presented the report on behalf of the Committee on Dairy Utensils:

We the undersigned committee on dairy utensils, find that there is on exhibition a gang cheese press with spring bead, exhibited by Richardson & Webster, of St. Marys. We take much pleasure in highly recommending this press to our factorymen. We also find a milk agitator exhibited by D. Ewing, of Cobourg, which we also recommend to the attention of dairymen. We also find a new curd cutter, exhibited by J. C. Grant, of Lakefield. It is practically the Harris mill adapted to steam power and should give satisfaction. Respectfully submitted.

Upon motion the report was received and adopted.

AUDITOR'S REPORT.

Gentlemen,—We have examined the books and accounts of your Treasurer, Mr. P. R. Daly, for the year 1893, and compared the same with the vouchers produced, and find them correct, leaving a balance on hand of $404.56. All of which is respectfully submitted.

Auditors. { Morden Bird, W. H. Thompson.

Upon motion the report was received and adopted.

(The detailed financial statement will be found in the Appendix.)

COMPLIMENTARY RESOLUTIONS.

Votes of thanks were passed to the railways, the press and the mayor and citizens of Peterborough for courtesies extended to the Association, after which the proceedings were brought to a close by the President declaring the meeting adjourned.

DAIRYMEN'S ASSOCIATION OF WESTERN ONTARIO.

OFFICERS FOR 1894.

President,	ANDREW PATTULLO, Woodstock.
1st Vice-President,	A. F. MACLAREN, Windsor.
2nd Vice-President,	J. S. PEARCE, London.

Directors :

Division No. 7	JOHN PRAIN, Harriston.
Division No. 8	HAROLD EAGLE, Attercliffe.
Division No. 9	JAMES F. WILLIAMS, Ingersoll.
Division No. 10	WILLIAM DICKSON, Atwood.
Division No. 11	Hon. THOS. BALLANTYNE, Stratford.
Division No. 12	JOHN GEARY, London.
Division No. 13	THOS. GIBSON Fordwich.

Honorary Secretary	C. E. CHADWICK, Ingersoll.
Secretary-Treasurer	J. W. WHEATON, London.
Auditors	JOHN ROBERTSON, Ingersoll. J. A. NELLES, London.
Representative to Industrial Exhibition, Toronto,	E. CASSWELL, London.
Representatives to Western Fair, London	JOHN GILMOUR, Nilestown. JOHN S. PEARCE, London.
Representatives to Central Farmers' Institute, Toronto	Hon. THOS. BALLANTYNE, Stratford. J. W. WHEATON, London.

LIST OF MEMBERS FOR 1894.

Name.	Post Office.	Name.	Post Office.
Airth, John	North Bruce.	Brown, W. W	Attercliffe Station.
Alderson, Joseph	Kintore.	Bongard, W. L	Crampton.
Allen, Edwin S	Box 233, Ingersoll.	Beaton, John	Brantford.
Alderson, George	Ingersoll.	Bodwell, James V	Mt Elgin.
Allan, Samuel	Ingersoll.	Bodwell, H	Mt. Elgin.
Arthur, John Lay	Kintore.	Bothwell, Wm	Woodstock.
Anderson, Wm	Woodstock.	Barr, S	Mossley:
Alderson, Thomas	Kintore.	Bates E	Mt. Elgin.
Adams, John	Putnam.	Brett, W	Ingersoll.
Atkinson, Wm	Medina.	Brown, James	Ingersoll.
Anderson, A. D	Wyoming.	Beaton, George	Norwich.
		Butler, Wm	Dereham Centre.
Booker, John	Kohler.	Barr, George	Culloden.
Bell, Elmer J	Glanford.	Brooks, T. H	St. Thomas.
Brooks, Henry	North Bruce.	Brodie, George	Gladstone.
Begg, W. A	Queen Hill.	Boyes, Frank	Nilestown.
Bain, Andrew	Port Elgin.	Boyes, George A	Nilestown.
Burgess, Joseph	Charlottetown.	Barry, T. D	Putnam.
Banks, O & R	Thamesford.	Bonser, J. H	South Middleton.
Burrell, D. H	Little Falls, N. Y.	Bedggood, John	Embro.
Baxter, Jno	Brownsville.	Butler, Marcus	Boston.
Biffin, A. J	Bright.	Bowey, John T	Avon.
Blayney, John	Lynnville.	Burkholder, H J	Brussels.
Butler, R	Ingersoll.	Briggs, J	Luton.
Bowman, C	Ingersoll.	Brodie, John	Mapleton.
Bigham, W. R	Culloden.	Burgess, R. L	Burgessville.
Brayley, C. H	Marston.	Burgess, George	Bluevale.
Beam, J. F	Black Creek.	Buchnell, J. A., jr	Ingersoll.
Brink, F. A	Beachville.	Butler, Thomas	Dereham Centre.
Bigham, J. P	Dereham Centre.	Brown, Hugh	Caistorville.
Bigham, Joseph	Hickson.	Brown, Thomas	Woodburn.
Bodwell, E. G	Salford.	Buckbee, W	Freelton.
Burrill, H. L	Ingersoll.	Bachelor, Benjamin	Birnam.
Boston, Robert, M.P.	Ferguson.	Bowes, E. T	Shelburne.
Bell, E. A	Crown Hill.	Breen, J. F	Melancthon.
Borland, John	Villiers.	Berwick, E & Co	Shelburne.
Bell, J. W	Box 97, Newmarket	Barr & Norton	Shelburne.
Brown, R. W	Ripley.	Baldwin, W. G	Colchester.
Ballantyne, T. J	Listowel.		
Brown, M. R	Appin.	Cornett, Robert	Dundalk.
Bell, A. T	Tavistock.	Caughill, George	Bismarck.
Blair, John	Britton.	Cummings, P	Port Elgin.
Baskett, Miss Sarah	London.	Clark, James	Vienna.
Brown, A. E	Ingersoll.	Chalmers, W. H	Salford.
Booth, Ed	Ingersoll.	Currie, G. G	Ingersoll.
Blackmore, J. G	Plattsville.	Cook, B. J	Ingersoll.
Ballantyne, R. M	Stratford.	Cook, G. H	Ingersoll.
Ballantyne, John	Pine River.	Carey, Wm	Ingersoll.
Bristow, James	Bright.	Charlton, T. W	St. George.
Baird, A. K	Motherwell.	Cook, Jno. W	Ingersoll.

LIST OF MEMBERS.—*Continued.*

Name.	Post Office.	Name.	Post Office.
Cleland, Robert	Listowel.	De Long, G. V	Harrow.
Carrigan, Phillip	Arkona.	Dempsey, D. A	Stratford.
Connolly, B. J.	Kintore.	Dempsey, John	Fairview.
Cook, W. H	Ingersoll.	Davidson, James	Stratford.
Cuthbertson, John	Wellburn.	Dunn, Ed	Ingersoll.
Carroll, Wm. J	Norwich.	Dickenson, Joseph	Springfield.
Crandall, John	Mabee.	Dunnet, W. S	Clanbrassil.
Cornish, W	Avon.	Deo, Charles	Gladstone.
Cleland, James	Listowel.	Dunn, J. P	Ingersoll.
Caddy, Thomas	Ingersoll.	Dewan, W. J	Lucan.
Clarke, Alex	Shakespeare.	Dunn, T. W	Ingersoll.
Corless, J. G	Burgessville.	Dunn, Jerry	Ingersoll.
Chalcroft, Ed	Delaware.	Dalton, W. H	Dorchester.
Cosh, Newton	Freelton.	Douglass, Wm	Camlachie.
Clark, C. A	Brooksdale.	Dickson, Wm	Atwood.
Comfort, Alonzo	Rosedene.	Duncan, Daniel	Don.
Campbell, Wm	Cannamore.	Duff, George	Winger.
Crosby, J. T	Marden.	Dunn, E. H	Evelyn.
Chalmers, Alex	Monkton.	Dalton, John	Vasey.
Crinklaw, J. W	White Oak.	Dick, James	Shelburne.
Connolly, James	Alsfeldt.	Deacon, Henry	Belgrave.
Clark, A. O	Sparta.		
Copeland, J. W	Eastwood.	Elder, Peter	Clanbrassil.
Connolly, John	Ingersoll.	Eagle, Harold	Attercliffe Station.
Collyer, Wm	Ingersoll.	Edwards, A. W.	Caistorville.
Carmichael, James	Arva.	Edwards, A. J	Woodburn.
Chowan, R	Ingersoll.	Edwards, Walter	Box 483, Ingersoll.
Chalcroft, Mark	Delaware.	Eager, Wm	Ingersoll.
Cooper, C. R	Toronto.	Evans, J. H	Tara.
Colwell, Wm	Drumbo.	Eccles, John	Bornholm.
Campbell, A	Thedford.	Elliott, James	Tilsonburg.
Cornett, Thos. H	Shelburne.	Everett, Chas	Brownsville.
Cornell, N. S	Elfrida.	Evans, John	Belmont.
Campbell, Mathew	Lawrence.	Ellis, Walter	Stirton.
Campbell, Peter	Lawrence.	Elliott, James	Bluevale.
Cranston, R. R	West Magdala.	Eede, R	Arner.
Crothers, H	North Port.		
Clark, Rev W. F	Guelph.	Flack, John	Avening.
Cochrane, James	Wingham.	Flac , Samuel	Lavender.
		Fearman, J	York.
Dillon, T. J	Charlottetown.	Ford, E. G	Lynn Valley.
Dawson, Wm	Victoria.	Facey, S. E	Harrietsville.
Dennis, John	Corinth.	Fillmore, J. W	Thamesford.
Dunlop, W. J	St. Marys.	Fulton, John	Freelton.
Dallas, John	Thedford.	Foster, Thomas	London.
Derbyshire, D	Brockville.	Ferguson, J. E	Ingersoll.
Downham, Peter	Innerkip.	Fewster, Wm	Mt. Elgin.
Donnolly, J. T	Strathroy.	Ford, Wm	Griffin's Corners.
Dickey, Gilbert	Komoka.	Foster, C. D	Port Royal.
Dickson, J. K	Holbrook.	Fraser, David	Banda.

LIST OF MEMBERS.—*Continued.*

Name.	Post Office.	Name.	Post Office.
Foster, F. R	Port Royal.	Hyslop, Thomas	Ingersoll.
Farrington, I. L	Norwich.	Hunter, A C	Welland Station.
Foster, S	Salford.	Harris, Miles	Ingersoll.
Facey, Robert	Harrietsville.	Hart, Thomas P	Woodstock.
Findlay, J. H	O. A. C., Guelph.	Hastings, W	Tilsonburg.
Feint, Wm	Vasey.	Hunter, Ed	Woodstock.
Fowler, Peter	Bluevale.	Head, Ed. L	New Perth, P. E. I.
		Henderson, Gavin	Perry's Station.
Gillespie, Hugh W	Ida.	Henry, A. P	Woodburn.
George, W. B	North Bruce.	Hockin, T. M	Box 434, Guelph.
Grant, Alex. W	Montreal, Que.	Hegler, J. C	Ingersoll.
Gray, James A	Atwood.	Hamilton, John	Shelburne.
Griffith, A	Thorndale.	Hillier, John	Otterville.
Garnham, E. A	Straffordville.		
Grant, J. C	Peterboro'.	Impett, Thomas	London West.
Galloway, George	Ingersoll.	Irwine, F. D	Windsor.
Galloway, E	Ingersoll.	Ireland, James	Beachville.
Grieve, J. S	Salford.	Ireland, Kenneth	Ingersoll.
Gray, G. R	Lyndoch.	Isaac, John R	Box 396, London.
Gibbon, W	Norwich.	Ireland, Robert	Beachville.
Goodhand, G. E	Milverton.	Irwin, H	Ingersoll.
Geary, John	London.	Iler, Wilson	Harrow.
Ginther, Ezra	Bismarck.		
Gilmour, J	Nilestown.	Johnston, Angus	Boyle.
Gibson, Thomas	Fordwich.	Johnston, Gilbert	Underwood.
Gibson, James	Fordwich.	Jackson, J. A	Straffordville.
Gallahar, Robert	Perm.	Jenvey, George	Ingersoll.
Gillespie, George	Shelburne.	James, J. A	Nilestown.
Gilbert, A. G	Ex. Farm, Ottawa.	Johnston, J S	Ingersoll.
		Johnston, Ed	Birr.
Harris, C. C	Hagarsville.	Johnston, Robert	Bright.
Hamilton, C. A	O. A. C., Guelph.	Jenvey, George	Ingersoll.
Hilker, Amos	Underwood.	Jackson, D	Freelton.
Howe, John	North Bruce.	Jarvis, J. E	Woodburn.
Hunter, Samuel	Rockton.	Johnston, S. P	Dunnville.
Hook, W. D	Ingersoll.	Johns, W. J	Vasey.
Hopkins, E	Evelyn.	Jelly, Simon	Shelburne.
Holland, Isaac	Culloden.	Johnston, W. J	Bluevale.
Hunt, Frank	Lambeth.		
Haight, D. B	Cornell.	Kirkland, James	Mt. Healy.
Hoover, John	Mt. Elgin.	Kidd, Martin	Aylmer.
Hurstfield, Wm	Glen Allan.	Kennedy, George	Tilsonburg.
Harris, J. C	Ingersoll.	Karn, James	Embro.
Henderson, J. T	Pine River.	Kneal, Wm	Holbrook.
Hulbert, Wm	Hawtry.	Kew, Daniel	Granthurst.
Howard, Samuel	Gorrie.	Kenny, George	Winthrop.
Hockey, H	Dereham Centre.	Kerr, Thomas	Woodburn.
Humphrey, T. J	Straffordville.		
Hunter, J	Verschoyle.	Laidlaw, Wm	Attercliffe.
Hopkins, H. P	Crampton.	Lamont, John	North Bruce.

LIST OF MEMBERS.— *Continued.*

Name.	Post Office.	Name.	Post Office.
Lamont, Alex	North Bruce.	McPherson, J	Fingal (Lake Road).
Laird, S. W	Stratford.	McKellar, D. A	Ballymote.
Linn, C. E	Lynedoch.	McCrae, John	Culloden.
Leitch, D	Strathroy.	McEwan, Frank S	Verschoyle.
Lee, S. R	Hickson.	McNaughton, J	Norwich.
Langford, Percival	Box 118, Ingersoll	McKie, George	Norwich.
Leak, F. A	Blytheswood.	McKenzie, James	Putnam.
		McCallum, Alex	Pond Mills.
Morton, Miss Jennie	Avening.	McLeod, G. B	Thamesford.
Murray, Robert	Avening.	McCoombs, A	Beamsville.
Murray, Wm	Underwood.	McIllwrath, J. H	Bookton.
Muir, Jno	Port Elgin.	McKay, Alex	Lucknow.
Moore, Jno. R	Pownal, P.E.I.	McCrow, Robert	Princeton.
MacLaren, A. F	Windsor.	McCallum, A. A	Gladstone.
Millar, T D	Ingersoll.	McKinnon, Allan	Queen Hill.
Morris, Wm	Avon.	McDonald, Samuel	Dundalk.
Millson, Frank	Pinkerton.	McDougall, T. T	Lambeth.
Moorehouse, Ernest	Ex. Farm, Ottawa.	McCallum, Hugh	Gladstone.
Monck, John A	Woodstock.	McMillan, D	Poole.
MacDonald, C. C	Box 393, London.	McLelland, Thomas	Ingersoll.
Mason, Wm. H	London.	McCrimmon, Sherman	Otterville.
Morrison, James	Henfryn.	McDonald, Geo	Bluevale.
Murray, Thomas	Avening.	McMurray, N	Gladstone.
Moote, Robert	Rosedene.	McArthur, Colin	Southwold.
Martindale, T	Mt. Healy.	McIntyre, A. M	Lawrence.
Milne, R. R	Paisley.	McCabe, J. A	Harrington.
Millson, S. C	Glanworth.	McKay, Dr	Ingersoll.
Miners, C. G	Tilsonburg.	McManus, J. R	Shelburne.
Moore, C. F	St. Clair, Mich.	McCormick, John	Kingscourt.
Mallory, T. C	Yarmouth Centre.	McKellar, D. N	Wingham.
Muir, Jno. B	Avonbank.		
Monk, L. D	Dorchester.	Nelson, Wm	North Bruce.
Morrow, H	Dundalk.	Nye, W. V. & Son	Avon.
Myers, Geo. A	Mt. Albert.	Newton, T. L	Salford.
Meek, Peter	Ingersoll.	Nancekivell, Wm	Ingersoll.
Mills, Geo	Thamesford.	Newcombe, N	Britton.
Morrison, J. A	Mt. Elgin.	Nagle, John	Delaware.
MacLaren, James B	Ingersoll.	Norton, F. D	London.
Millar, T. B	Burgoyne.	Noxon, Stephen	Ingersoll.
Maule, Arthur	Gladstone.	Nichols, Enoch	Burgessville.
Marr, Wm. J	Forks Road.	Nimmo Bros	Ripley.
Middleton, Isaac	Winger.		
Moore, Harmon	Forks Road.	Olmstead, W. H	Vars.
Millar, Jno. F	North Bruce.	Ostrander, J. M	Waldwick, Wis.
Morrison, James T	Orono.	O'Neil, J. H	Harrietsville.
Mitchell, Louis	Embro.	Orme, James	London.
Mason & Millar	Shelburne.	O'Meara, Thomas	Ingersoll.
Mellon, Wallace	Forest.	O'Flynn, Timothy	Kinkora.
Messer, Wm	Bluevale.	O'Callaghan, Joseph	Ingersoll.
McLean, W. H	Crinan.	Osmond, David	Peebles.

LIST OF MEMBERS.—*Continued.*

Name.	Post Office.	Name.	Post Office.
Ormerod, Wm	Napier.	Rounds, Arthur	Harrington.
		Roberts, Thomas	Allenford.
Parr, F	Hampton.	Ryan, Ed	London.
Parke, Alex. A	Watson's Corners.	Robertson, Jno	Box 263, Ingersoll.
Prain, John	Harriston.	Russell, Jno. W	Boston.
Pettigrew, Robert	Bright.	Rosenbargo, Joseph	St. Marys.
Paterson, Ernest	Box 436, Ingersoll	Richardson & Webster	St. Marys.
Pearce, Thomas J	Wallacetown.	Riesberry, John	Bright.
Potter, P. J	Mono Mills.	Reeves, David	Woodstock.
Pearce, Jno. S	London.	Ross, Alonzo	Iona Station.
Pow, Wm	Mt. Elgin.	Rumney, Mathew	Vasey.
Pearson, Isaac	Corinth.	Richardson, Benj	Watford.
Polland, John	Ingersoll.	Richardson, H. P	Kerwood.
Palmerston, N. S	Walsh.	Robertson, Geo. S	Lucknow.
Pogue, J. H	Little Britain.		
Pate, James	Brantford.	Stubbs, Wm	Mono Road.
Prouse, John	Ingersoll.	Stewart, Chas	Flesherton.
Paget, J. N	Canboro'.	Struthers, James	Underwood.
Price, Lewis A	Mt. Elgin.	Smith, Robert	Port Elgin.
Phelps, L L	Mt. Elgin.	Sutherland, Andrew	Port Elgin.
Phelps, C. D	Bayham.	Smith, Arch	Beachville.
Pomeroy, Wm	Mitchell.	Smith, Levi	Box 551, Ingersoll.
Pickard, Amos	St. Marys.	Sands, A. M	Culloden.
Phelps, Louis	Eden.	Smith, O. T	Binbrook.
Patterson, Francis	Thamesford.	Smith, Andrew	Culloden.
Parker, R	Atwood.	Smith, S. A	Glanworth.
Perkins, J	Leesboro'.	Stacey, John	Newton.
Prouse, Thomas	Mt. Elgin.	Stone, Ed	Verschoyle.
Pierson, W. J	Innisfail, Alberta.	Spicer, J	Harwich.
Podmore, John	Ingersoll.	Stacey, Wm	Fullarton.
Penhale, T. J	Mapleton.	Stevens, H. B	Lambeth.
Peacock, Miss M. J	Mt. Salem.	Steinhoff, J. W	Sebringville.
Peters, Oliver	Brunner.	Smith, Wm	Mt. Elgin.
Pattullo, Andrew	Woodstock.	Schrumm, Alf	Bismarck.
		Shantz, E	Wallace.
Roode, E. A	Hulbert.	Smith, A	Verschoyle.
Richardson, John	Ingersoll.	Stewart, J. F	Montreal, Que.
Richardson, Peter	St. George.	Stevely, Wm	London.
Ruddick, J. A	Ex. Farm, Ottawa.	Sparta, J. W	Sparta.
Ruckle, George	Ingersoll.	Snell, Robert	Norwich.
Rallings, Walter	Walsh.	Stratton, R. W	Straffordville.
Riesberry, A	Bright.	Sandick, L. A	Ingersoll.
Raymond, George	Ingersoll.	Shuttleworth, A. N	Peebles.
Richardson, L. R	Strathroy.	Sands, Arch	Culloden.
Roberts, H. A	Beachville.	Skuse, I. A. M	Ingersoll.
Roberts, L. H	Peebles.	Stevenson, S. K	Jura.
Rudd, O. E	Guelph.	Stirton, James	Verschoyle.
Rickard, Philip	Crampton.	Smith, Nicholas	Peebles.
Rumble, John	Holbrook.	Simistir, R. A	Ingersoll.
Riley, C. W	Ingersoll.	Sinclair, James A	Teeswater.

LIST OF MEMBERS.—*Concluded.*

Name.	Post Office.	Name.	Post Office.
Skinner, R. A.....	Ingersoll.	Thompson, Wm	Arkona.
Smith, C. W.....	Centralia.	Thompson, Henry	Holyrood.
Seldon, Richard	Ingersoll.		
Spavin, Wm	Hagarsville.	Venning, Andrew.....	Mossley.
Stillman, J. H	Ingersoll.	Venning, A. E	Mossley.
Stacey, Thomas.....	Fullarton		
Smith, Reuben	Mt. Elgin.	Wetherall, Wm	Lavender.
Struthers, E. A.....	Russell, Man	Wallace, S. T	Conn.
Swan, Robert	Toronto.	Wright, John	Port Elgin.
Shields, Albert	Caistorville.	Webb, George.....	Port Elgin.
Shaftley, N.....	Wellandport.	Whitelaw, R.....	Woodstock.
Sider, Andrew.....	Forks Road.	Waring, Ed	Newark.
Sunday, John	Bismarck.	Watson, Robt. S.....	Bunyan.
Saul, I. T	Birr.	Walker, Geo H	Ingersoll.
Shields, J. W	Mono Road.	Wilson, George.....	Verschoyle.
Smith, W. L	Shelburne.	Waddell, James	Kinloss.
Smith, Wm.....	Watford.	Wardell, Thomas	Innerkip.
Smellie, Joseph	Bluevale.	Wyles, W. J.....	Woodstock.
Smith, E A.....	Otterville.	White, H.....	Belfast.
		Woods, Wm	Molesworth.
Teeft, Wilbur.....	Attercliffe.	Williams, Jno. H.....	Milton West.
Teeple, R. C	Port Elgin,	Wilford, John.....	Brownsville.
Talbot, Richard.....	Avonbank.	Wilson, C. C. L	Ingersoll.
Terry, Edwin	Rodney.	Whittaker, J. E.....	Box 545, Ingersoll.
Tindall, W. A.....	Badjeros.	Wood, George.....	St. Marys.
Thomas, J. H	Ingersoll.	Wilkinson, J. H.....	Verschoyle.
Taylor, F. C	Gorrie.	Wilson, Hugh E.....	Arkona.
Trumm, Daniel	Bismarck.	Waddell, Wm.....	Kinloss.
Teffry, Chas.....	Hawtry.	Wallace, Alex.....	Verschoyle.
Thornton, John.....	Beachville.	Williams, J. F	Ingersoll.
Tanton, John	York St., London.	Wills, Henry.....	Winger.
Talbot, L. C	Lucan.	Wills, J. G	Winger.
Tuttle, A.....	Salford.	Webb, T	Woodburn.
Tehen, Theo.....	Otterville.	Webb, Lewis S.....	Caistorville.
Tackaberry, N.....	London.	Whitter, J	Shelburne.
Travis, F. E	Straffordville.	Woods, Wm	Watford.
Tavis, C. C	Acacia.	Willoughby, W. G....	Walnut.
Tice, Frank.....	Holbrook.	Wilson, B	Wingham.
Taylor, J. T.....	Caistorville.	Whealen, Rev. T. F ..	Colchester.
Twiss, B	Woodburn.		
Talbot, J. T.....	Wyton.	Young, A	Princeton.
Thompson, Robert	Eastwood.	Young, Thos. E.....	Strathroy.
Tuck, R. W.....	Shelburne.	Young, R.....	Thamesford.
Thompson, Wm	Birnam.	Yoder, John	Springfield.

SEVENTEENTH ANNUAL CONVENTION

OF THE

DAIRYMEN'S ASSOCIATION OF WESTERN ONTARIO.

To the Honorable the Minister of Agriculture:

SIR,—I have the honor to submit herewith the Annual Report of the work of the Dairymen's Association of Western Ontario for the year 1893.

Dairying in Western Ontario during the year 1893 has been stimulated in many ways and has commanded more than ever the attention of the farmer. There are many reasons for this. The unprecedented success which Canada obtained for her display of dairy products at the World's Fair has no doubt inspired our dairymen with more confidence and given them to feel that in this particular branch they are and can be successful if they give attention to it, and recognize fully the suitability of our climate and country for carrying on all kinds of dairy farming. Likewise the farmer himself, is beginning to realize more and more, that, if he puts intelligence and good judgment into the selection and care of his cows; the providing them with suitable food and good water and will give particular attention to preserving the milk in its pure condition, there is more profit in dairying than in any other branch of his business. Consequently this branch of agriculture in the future will be more than ever the stand-by of the Ontario farmer and as such be the means both of making his particular vocation a more profitable one and also of increasing the fertility of his farm and making it more productive.

The output of cheese in Western Ontario last season was considerably less than the year previous. Due entirely to the exceedingly dry weather of August and September. This dearth of rain had the effect of drying up the pastures and lessening the supply of succulent food, which cows require, in order to keep up the flow of milk; besides, the majority of our dairymen have not yet adopted the practice of growing supplementary feed to tide their cows over the dry period. Until they do, they are likely to lose more or less in quantity of milk during the usual dry weather of these months. The price of cheese however has been somewhat higher than in 1892. This has tended to ameliorate somewhat the losses from a shortage in production. There is one fact in reference to the selling of cheese to which it might be well to draw attention just here. Too many factorymen are accustomed to hold their cheese, during the summer months especially, in order to get a higher price, or are loth to sell until they know what neighboring factories are selling for. This creates an irregularity in the operations of the markets, as very often buyers receive orders to buy goods within a certain limit and cannot get their orders filled because the factorymen won't sell. The consequence is, these orders are sent elsewhere to be filled and the factorymen have their cheese on hand and frequently in stock when the make of the next month is ready to sell. The effect very often is that the cheese so held are sold at a lower price than the first offer, which injures considerably the sale of the newer cheese, and that the patrons are dissatisfied because they do not get their cheques regularly. If the factorymen would adopt the plan of selling their cheese at the highest market price going, whenever they are ready for shipping and get them into consumption as soon as possible, the law of supply and demand would be better regulated; patrons would be better satisfied in getting their cheques regularly and the trade generally benefited and business facilitated.

Winter dairying, has made rapid progress in Western Ontario, considering the comparatively short time since the movement began. There are not so many cheese factories

making butter during the present winter as was anticipated some time ago. This is due largely to the supply of milk falling off during the dry season, and also that many farmers were compelled to encroach upon their winter's store in order to get food to tide their cows over this dry period, and therefore had not sufficient means of producing enough milk to make winter dairying profitable. All the factories which had the apparatus for making butter already in place are in operation and are contributing additional evidence as to the success and profitableness of this branch of dairying.

The Association was unusually active in looking after the dairy industry of Western Ontario during the past season. A competent inspector and instructor was employed, who visited a number of factories during the cheese-making season and gave instruction in the best methods of making cheese, and who also inspected the milk delivered at these factories. He was particularly successful in bringing to justice a number of patrons who were tampering with milk. From the many reports which have appeared during the past season in reference to this particular branch of the work it may seem to many as if the practice of tampering with milk were on the increase. Such is not the case however. The large increase in the percentage of convictions last season was entirely due to the fact that more accurate and reliable testing instruments are available, and that the experience and good judgment of the inspector rendered it very difficult for a guilty person to escape conviction. The Dairy School at Tavistock was continued, but was not so largely attended as formerly, due doubtless to the establishment of the Provincial Dairy School at Guelph.

The Association also endeavored to serve the Dairy Industry by arranging for a system of instruction during April and May, in the best methods of making early spring cheese, and by providing that factories which had adopted the system of paying for milk by the percentage of butter-fat, could have assistance if they desired.

The new policy of the Association inaugurated over a year ago was pushed forward with much vigor and attended with splendid results. The Secretary and others under the auspices of the Association attended 105 local dairy meetings and addressed upwards of 7,000 farmers on the best practices in dairying. Four very successful local conventions were held last March and were largely attended, upwards of 1,500 farmers being reached by this means. More detailed accounts of these and the other branches of the work carried on by the Association are given in the reports of A. T. Bell, Inspector Millar and the Secretary, which are included in the proceedings of the Convention.

There were on the rolls as members for 1893 over 600 names. Already there are enrolled as members for 1894, 567 names, which number will be largely increased during the winter.

The Seventeenth Annual Convention was held in the town of Ingersoll on January 23rd, 24th and 25th, 1894, and was considered by the older dairymen present to be the most successful gathering of its kind in the history of Canadian dairying. The interest and enthusiasm shown was only equalled by the crowds which sought admission to the Hall during the proceedings of the Convention. An accurate account of the addresses delivered and the discussions that took place are given in this report.

The Board of Directors and members of the Association have again great reason to be thankful to you and your Department for the kindly interest taken in its work and for the liberal grants received to meet the numerous demands and expenses incurred in making the work of the Association as useful as possible to the dairy industry of Western Ontario. It is confidently hoped that the policy of the Association may continue to meet with your approval and merit your good favor, and that you may always feel that the money, which your Department expends through the medium of the Dairymen's Association of Western Ontario is being wisely used to improve the position of the farmer and to make his business more profitable.

All of which is respectfully submitted.

Your obedient servant,

J. W. WHEATON,
Secretary.

London, Ont., February 2nd, 1894.

SEVENTEENTH ANNUAL MEETING

OF THE

DAIRYMEN'S ASSOCIATION OF WESTERN ONTARIO.

The seventeenth annual meeting of the Association was held in the town of Ingersoll, on January 23rd, 24th and 25th, 1894. The attendance at the various sessions was larger than usual and the gathering generally was pronounced to be a most successful one.

AN ADDRESS BY MR. PATTULLO.

Mr. ANDREW PATTULLO, in the absence of the President took the chair and called the meeting to order. He said: I am sorry that the meeting this afternoon must begin with an explanation. The President of the Association, Mr. Geary, of London, came here on the morning train only to find a telegram urging him to return to London on important business. He met me at the station, and, as he had not seen either of the vice-presidents he asked me to take his place at this afternoon's session. One of the vice-presidents is absent and the other is too modest to preside, and he insisted upon my doing as Mr. Geary requested. I am glad, however, to be able to tell you that the President will be here at this evening's session and will deliver his address. On his behalf I desire to say a few words. I am delighted to see so large an attendance at the opening of the meeting. It is not often that one of our conventions opens with so large and thoroughly representative a gathering. There will be large accessions to our numbers this evening and to morrow, and I think it is safe to predict that this will be one of the most successful conventions in the history of the Western Dairymen's Association. And so it should be, for meeting in Ingersoll we meet upon historic ground. This is the original home of the dairy industry in the Dominion of Canada, though there is a gentleman upon the platform who would probably claim that honor for eastern Ontario. It is according to the eternal fitness of things that our convention should be held here, and that it should be a magnificent success. As a member of the Executive I was more than delighted to have the meeting held in Ingersoll. This town has not had it for several years, and our early meetings here have always been successful. The fact that the people have turned out to make the meeting a success is proof that the old spirit has not died out. I do not need to dwell upon the progress of the dairy industry. You know that Mr. Farrington in 1864 started the first factory near Ingersoll and that from this small beginning has been developed the greatest industry in the Dominion of Canada. It is like a romance to read the progress of this industry from such small beginnings until now, when we export over thirteen million dollars' worth of cheese a year. The dairy industry has done more than anything else to keep our farmers comparatively prosperous when they might have been the very reverse. Changes in agriculture have made it impossible for farmers to work profitably on the old line, but the dairy farmers during all these years have been uniformly prosperous. With one single exception there has not been a year when the price of cheese has gone below the line at which the article cannot be made with profit. Of no other branch of agriculture can this be said. The consequence is that in this district and in others where cheese-making is carried on the farmers are more prosperous than those engaged in other branches of the farming industry. Representing, as we do, the greatest Canadian agricultural industry, it is natural that our meeting should be a large and successful

one. The programmes are in your hands, but some changes will be necessary. Some of those whose names are on the programme have not yet arrived, but we have here already a number of gentlemen whom you will be glad to hear. We have the president of the Creameries' Association, Mr. Derbyshire, with whose name you are all familiar. If you treat him as well as he treated some of us who were down at Peterboro' and Belleville, you will give him a very warm welcome indeed. We have also a number of our friends from the other side of the line. It has always been a pleasure for Canadian dairymen to learn from their neighbors in the United States We have always welcomed Governor Hoard, and we have learned a great deal from him and others across the line. As a people, I think, we have been sensible enough to take hints and information from whatever source they came. And if the Americans have been our teachers, as some of them have, I think they will admit that their pupils, in the practice of dairying, have gone even a little beyond their instructions, because we showed them what we could do, as you know, at the World's Fair. We have Prof. Van Slyke, whom you heard at the last convention, and whom all will be glad to hear again. Those who are familiar, as most of you are, with Hoard's Dairyman, are well acquainted with the name of John Gould, of Ohio, and have benefited by the practical hints he has given through that journal. When I tell you that we have Mr. Gould with us at this meeting you will agree that we have not met in vain. We hear a good deal these days about education, and sometimes I think we have too much education of a certain kind. I am not sure but that some of the education in this country is misdirected, that some of our boys are learning what will be of very little use to them in practical life. My own belief is, that such Associations as this are among the best schools in the country after all. Speaking on the subject the other day at Belleville, I referred to the work being done by the Agricultural College at Guelph, and the Dominion Experimental Stations at Ottawa and elsewhere. My own deliberate opinion is, that the most useful educational institution in Ontario, is the Agricultural College. I do not discuss the manner in which it is run; I believe it will always be well run, for it is in good hands. That is where the future farmers of this country are being educated, and it is an institution above all others to which I would recommend farmers to send their sons. If you want your sons trained properly to take up the work of a farm, do not send them to high schools and colleges, but send them where they will learn something they can make use of in after life, something that will keep them on the farm, and not to a place where they will learn that which will turn them away from the farm. I desire to point out that in the truest sense these dairy associations are educational institutions. Some of you older men do not have the opportunity of going to such institutions as the Agricultural College. But you have the wisdom to meet in these associations and educate yourselves. We hear sometimes about a boy having finished his education. One can never finish his education until he is in his grave. The farmers are meeting in their institutes and lodges and dairying conventions and assemblies of cheese factory patrons, and in these meetings the farmer improves his knowledge and his methods of work. You are not met here for pleasure or social intercourse, but for education, to improve yourselves in carrying on the great industry with which you are connected. I have spoken longer than I intended. Had I had an opportunity to prepare, my speech would have been shorter.

COMMITTEES.

The CHAIRMAN: The first business is usually the naming of a Nominating Committee. I will name: Mr. J. F. Williams, South Oxford; Mr. J. W. Cook, of Ingersoll; Mr. Hately, of Brantford; J. A. James, Nilestown; and R Parker, Elmira. Does this meet your approval? Carried.

Mr. J. S. PEARCE moved that the following be a Committee on Resolutions: Andrew Pattullo, William Climie, J C. Hegler, C. E. Chadwick and John Podmore. The resolution was seconded by Mr. DICKSON and unanimously carried.

Mr. PRAIN moved, seconded by Mr. R. PARKER, that the following be a Committee on Dairying Utensils: J. A. Ruddick, J. W. Cook and C. W. Riley. Carried.

SHORT TALKS FROM VISITORS.

The CHAIRMAN: As two of those who were to have addressed you this afternoon are absent, it has been suggested that we should hear briefly from some of our friends who are here. By way of introduction, I will first ask Mr. Derbyshire to say a few words.

Mr. D. DERBYSHIRE: I think that if there is any product of our country we ought to feel proud of, it is our Canadian men and women. I am glad to meet the Western convention because of the great work you have done in the past and the record you have made in the manufacture of fancy cheese. While your chairman was talking, I was thinking of Leeds county,—that is, the Brockville section. The chairman knows, as well as anyone else, that Leeds county manufactures more cheese than any other county in the Dominion. That is a record you can verify by looking into the blue books. The next point is that Leeds county secured more "99½ points" at the World's Fair than any other county in the Dominion. Our success there gives us good reason to be proud of our Canadian men, and there was nothing from Canada which I took so much pride in as our good friend Mr. Maclaren, who, as one of the judges of cheese, by his good looks and courtesy was able to win the two American judges and to make them perfectly satisfied with the proportion of prizes given to Canada. We gained far more prizes than even the most sanguine of us could have expected. I give credit to the people who produced the milk, to the men who handled it in the factory and to the people who were selected to see that our products were properly placed at the World's Fair. And we must not forget to thank our American friends for giving us the opportunity in this wonderful Exposition to bring our products thus prominently before the world. That exhibition will probably never be equalled again in our time, and it must be satisfactory to the Americans to feel that they have given this crowning manifestation of the possibilities of the century. We as Canadians must feel proud of our achievements in this cheese industry within so short a time. But now that our products have been shown others will take up our methods and will even improve on them, thus taking a step in advance of us. The duty of the hour with us is to take that step in advance so as to meet competition when it comes. And that can be done by these conventions stirring our people up to keep a better cow in a better way, to have better factories and better machinery, to have better men, and to produce a finer article than ever before. The record of the past is nothing to what we can do. To think that thirty dollars a cow is all that we could do in the past in this Empire Province with such grand facilities as we have! To think that standing in many of our factories we can see the heavens above and the earth beneath, so that in them we have no chance to control the temperature, no skilled men to educate the patrons in taking care of the milk and bringing it to the factory in prime condition! There is much to be done. I hope we may take up the various questions and discuss them fully, that we will learn all we can during this convention and go home with the determination that we will make in 1894 a finer product than we made in 1893. The taste of our customers is being educated and they require finer goods. Every year there is a greater demand for a finer quality. It is our business and our duty, and it ought to be our patriotic pleasure, to see that we turn out the finest product that can be furnished in the world and that we, the Canadian people, shall be the great furnishers of these goods to our Old Country friends. I am anxious that these western people shall keep to the front and that you should do your best to beat the Brockville section, but I want to whisper to you that if ever a strong effort for improvement was made it is going to be made in our section in 1894. The Dairy School at Guelph is filled with young men from our section who are there to get a better education for carrying on their life work. Never in the history of the country has any section taken the advance step we will take in Brockville section this year. As a Canadian I am anxious that you should keep pace with us, so that from end to end of the Province we may have a fine product, and get the highest prices for our goods besides making even a greater reputation for ourselves as the producers of the finest that goes into the market.

The CHAIRMAN: I have much pleasure in calling on Prof. Van Slyke.

Prof. VAN SLYKE, Geneva, N.Y.: I am glad to hear Brockville speak out. Its

representative is more modest at home even than when away from home. He told us that if we would come down to his country they would teach us something; that we didn't know anything about making cheese and he could prove it. I am over here to learn When I was over here last year I learned something and that was that you were going to beat the world at the World's Fair. When I learned what you had done and how little had been done on the other side I realized that the prediction had been fulfilled. I may say that they have not given over there yet, that they are not going out of the dairy business. There are going to be just as many cheese factories as there were before, and perhaps a few more, but they are going to make better cheese. They have received a plain lesson. You know you can teach a man politeness by knocking him down. We have no difficulty in understanding the lesson you have taught us. The Yankee is inclined to improve, to take advantage of his opportunity. The only trouble last year was that they did not work their brains enough and you got ahead of them. I do not think you have any more brains than we have, but you exercised them a little more. There will be hustling over there before the next World's Fair because you have taught us how to do it. From what I have seen on both sides I am of opinion that Canadians "catch on" to a new idea more quickly,—that they are somewhat more conservative on the other side. One thing I should mention, perhaps, above everything else. You had a general and we had none, and it requires a general to lead if there is to be a victory. I am very glad to be here. I benefited by my visit last year and I hope to do so again, and if in any way I can benefit you I shall be glad to do so. I hope when I go to carry back some ideas to the Yankees.

The CHAIRMAN: Prof. Van Slyke's remarks, though partly in a jocular vein contain a lesson which I hope our dairymen here will heed, and that is that, though we beat the Americans in the cheese competition, we must remember that they are cute enough to learn. We do not want to prevent them from making good cheese. We have taught the people of Scotland to make good cheese. Mr. Drummond from this district went over there and taught them our methods, and they are making better cheese even than we do. We must not merely keep pace with others, but we must keep in advance. I would not dispute the accuracy of anything a gentleman would say on this platform, but I was surprised at the statement made with regard to Leeds county, and I wondered if Mr. Derbyshire's enthusiasm for his own county had not led him into a slight inaccuracy. I would not be afraid to put the county of Oxford in competition with the county of Leeds; I know we got one "99½" and I know our friends in the north got one, but I do not remember any factory in the Brockville district—

Mr. DERBYSHIRE: Mallorytown, Lanark factory.

The CHAIRMAN: I was informed that the Leeds county factories were not ahead of the county of Oxford. However, if that is the record, I am glad to have brought the point out.

Mr. DERBYSHIRE: We are going to make 100 this year.

The CHAIRMAN: We had a lot there that ought to have been marked 100, but somehow the judges did not do it. I have now much pleasure in introducing Mr. John Gould of Ohio.

Mr. JOHN GOULD: I am glad to come to Canada. There is a freemasonry, a give and take among dairymen If one of them finds out something new he is ready to go and tell his neighbors. I want to say on behalf of our dairies in Ohio that we did not make any exhibits of cheese, so we have no dispute as to who got the 99¾. The kingdom of the cow knows no boundary line. The cow in Canada is own sister to the cow in Ohio. The same elements that fit the grass for our cows in Ohio fit it for the cows in Canada, and when you come down to the facts it is brains that feeds the cow, it is brains that cares for the milk, and brains that makes the product and fits it to take the highest premium in competition with the world. So I am glad to come to Canada to talk with your dairymen. I do not expect to say anything except what you have heard a hundred times but I hope to learn something new. The last injunction I got from our Dairy Commissioner when I was leaving

was: "Tell the people in Canada all you can, but be sure you bring back all the information you can, for there is no duty on it and we can get it free into Ohio."

The CHAIRMAN: No matter how much we may differ in regard to some things, we are glad there is no duty which prevents our friends from across the line being present with us on occasions of this kind. Mr. John S. Pearce will now address you on the subject of Canadian butter at the World's Fair.

CANADIAN BUTTER AT THE WORLD'S FAIR.

Mr. JOHN S. PEARCE, London: My object is not to tell the Canadian butter-makers how to make butter, but to point out some of the defects that struck me very forcibly while judging butter at the Fair, in order if possible to bring about some improvements which are very necessary in making of our butter.

Mr. PEARCE then read his paper on Canadian Butter at the World's Fair, which will be found in the report of the Creameries' Association Convention.

The CHAIRMAN: The chief value of these meetings is not so much in what is said by the gentleman who introduces the subject as in the discussion which takes place afterwards. The paper we have just listened to is a most valuable one. It comes from a man who knows exactly what he is talking about. While some gentlemen are down for papers and addresses, every member is expected to take part and if you have any idea on the subject of butter-making or any questions to ask, the meeting will be glad to hear you. We have here Mr Ruddick, Mr. Price, from the Mount Elgin factory, and a score of others I could name who have a large fund of information on the subject of butter-making.

Mr. O. T. SMITH, Brantford: How much salt did you use?

Mr. PEARCE: About three-quarters of an ounce to a pound of butter. I want to say another word. I can not emphasize this question of salt too much. The more I have thought about it the more I am convinced that a great deal depends upon getting pure salt, and not only getting it pure but keeping it pure, that is, free from contamination and atmospheric taint, until it is used.

Mr. JOHN BLAYNEY, Windham: What particular brand do you recommend?

Mr. PEARCE: It is not usual at these meetings to recommend the goods of particular manufacturers. But I may say that the brand that I have been recommending is Rice's butter salt. Ashton's is just as good.

Mr. GOULD: How do you put up an ideal package of butter?

Mr. PEARCE: I think Mr. Gould himself is the person to tell us that. I may say that I was very much struck with the way in which the butter shown at the World's Fair was put up. I would like to have Mr. Gould tell us the best method.

Mr. GOULD: I would rather hear the other fellow first; then I have the best chance. I think the great trouble is that too much is put into the package at a time. I have seen men put in two lumps to fill a 56-pound package and, of course, they had a lot of water in they could not get out. Better put a little at a time and pack it close. We wrap a cloth around our hand and pack the butter with our fist. Then when you get through, round it right up on top; then take a string and draw it through even with the top of the package. Then the top will not be smooth and will not have the greasy look that butter has when it is smoothed over. Leave it as rough as possible and cover as you see fit.

Mr. PEARCE: I think Mr. Gould is right except on one point, and that is as to having the butter level with the top of the package. The neatest packages I saw in Chicago were within $\frac{1}{4}$ or $\frac{1}{8}$ inch of the top of the stave, then the cloth laid on and enough salt put in to fill the space between the butter and the lid.

Mr. DERBYSHIRE: Not a cloth—parchment paper.

Mr. PEARCE: Yes, parchment paper more properly speaking. This prevents the top of your butter getting a woody flavor from the tub. I will explain how they accomplish this finish. They took a piece of narrow board and cut it so that it would fit closely into the tub, going down about a quarter of an inch below the top of the stave and then turned it in the filled tub, and the result was the top of the butter looked as though the tub had been in a turning lathe. Appearance goes a long way in butter, quite as much so as in cheese. We in Canada have learned that with regard to cheese, and one of the points that struck our friends in Chicago was the uniform finish and fine appearance of our goods. I want to relate an incident with regard to that. Mr. Curtis, secretary of the Wisconsin Association for years, was over to Canada last fall. I asked him if he would like to see our factories and drove him up to one of the factories of our worthy president, Mr. Geary. After he had been around and asking a great many questions we went into the curing room. I never saw a gentleman more surprised than he was at the appearance of the cheese as they stood on shelves. It was a revelation to him to see the uniformity with which they were made. I got instructions from him to buy two cheese and ship them to Wisconsin as an object lesson.

Mr. DERBYSHIRE: I agree with what Mr. Pearce has said. The very look of our butter condemned it in comparison with some of that shown by our friends on the other side. We cannot be too careful to pack our butter properly, and in a style that will create a favorable impression as soon as it appears on the market. Now our style was not as good as that of the Americans, as shown at Chicago, and that was a humiliation to me as a Canadian. Mr. Gould is quite right as to the method of packing. It does not do to put in half a tubful at once and then try to pack it down, for spaces are sure to be left filled with water or air. Pack in small quantities so that you may be sure that you are packing close. We put a piece of parchment paper in the bottom, and we have the same between the inside of the tub and the butter. Then I believe if we can have a finish within a quarter of an inch of the top, as Mr. Pearce has described, it will be better. This packing calls for skill. I know a factory in New York state which has five skimming stations; that is stations to which the farmers bring their milk and have it weighed and skimmed, the skim-milk being taken home and the cream for the central factory. At the factory one man takes care of the churning, and one man looks after the packing, and thus becomes an expert in that line. I am satisfied for the present to copy that man's method. He used this thin board, as Mr. Pearce has described, and just gave it one turn on top of the butter in the tub. There was no patting it and smoothing it, then finishing up with horseshoes and roses as you sometimes see done—you don't want that. Then fill the space with salt so that when the lid is put on it will press down on the salt and make the package airtight. The moment the cover is taken off and the parchment paper raised, you get the rich aroma of the butter. We should have no butter but the best. We should have our factories fitted up with the best possible machinery, run by the most skilful men, producing goods perfect in every detail. We should not make any of this trash that will not sell for more than fourteen or fifteen cents. We should not allow anything go out that is not perfection. We have the cows, the men, the grass, the climate, the water, to make the finest butter and cheese in the world. We only need to use with skill the materials that we have.

Mr. J. A. RUDDICK: I would like to ask if it would not be an advantage to have exactly the same weight in a lot of tubs. The reason I ask is that it seems to me that the plan of turning off the top would make it impossible to get exactly the same weight, for that will vary a little according to the temperature of the butter or the way in which it is packed.

Mr. DERBYSHIRE: In the first place I would have the package made by machinery and turned inside and out. Then every package would be exactly the same size, and then, if skilfully packed, you could tell within a quarter of a pound what every package was going to weigh. You shake your head. I tell you they will weigh pretty near alike if the same hand packs the butter in the tubs. But suppose there is a variation of a pound. I would not care for a variation of four pounds if it was perfectly made and perfectly packed, and would bring the highest price. Whether the package is fifty,

fifty-six, or seventy pounds, we want to get the tub full, the top of the butter being covered with salt, and the cover fitting down on top of the salt to make an air-tight package, so that the butter when it arrives in the market will be in perfect condition. One point about our butter in Chicago—it took eight days from Canada to Chicago, and then there was trouble with the customs regulations, and the butter had to go directly to where it was to be judged. But our American friends were careful enough (besides having the advantage of a much shorter railway journey) to slide the goods into cold storage keeping it down to forty degrees, and from there it was brought before the judges. In these points we lost. I do not object to that. They are sharp and bright, and their success ought to teach us a lesson. Mr Ruddick's point is well taken, it would be some advantage to have the packages weigh alike. It could be easily done if we could weigh the butter before packing. But let your fifty pound packages weigh fifty and three-quarter pounds. Put in the additional three quarters to make sure it will hold out in weight. The same way in cheese. The man who receives your goods sees that you are willing not only to give him the finest quality, but also sixteen ounces to the pound.

Mr. RUDDICK: We have tried several different kinds of packages, but we do not seem to get the perfect one without it costing too much. Our practice for the creameries throughout this part of the country (I speak particularly of the dairy stations) is to fill the tubs to a certain weight. The tubs we are using to-day were intended for fifty pounds They hold fifty-two pounds, leaving room enough on top for a layer of salt. We line the tubs with heavy double parchment paper. We fill the tub nearly full—fifty-two and-a-half pounds in each tub. We pack it down as level as possible and smooth off the top. Then we cover with another piece of parchment paper, tucking the edges down except one little corner where it can be pulled up to try the butter. If it is not tucked in the parchment paper will dry and rise a little. Of course if it does not get dry it will not rise; but in rising it leaves an air space. That is an objection to having anything but the best of paper on the butter. Then put on the salt to fill up the space between the parchment paper and the cover. This winter we have filled a few packages made this way: We got two tin cans that will hold fifty pounds each placed side by side in a box. These cans were lined with parchment paper, the edges being trimmed off close to the top. The butter was then put in. There is a peculiar arrangement of the edge of the tin which I cannot very well explain, the edge of the cover turned down about a quarter of an inch and slipped into a groove in the edge of the can. That makes a tight package. We have a good report of some that went to British Columbia. You know the English market decidedly objects to a tin package, because it is said the tin is apt to impart a taint to the butter immediately next to it.

The CHAIRMAN: When you have an expert maker like Mr. Ruddick before you I think you had better cross-examine him. He is full of information and is always ready to answer questions.

Mr. BLAYNEY: Where do you market your butter?

Mr. RUDDICK: Some goes to Toronto and some to London, but the bulk of the butter that has been made in the Government creamery has been going to British Columbia under a contract which is now nearly concluded.

Mr. BLAYNEY: Where do you get your best market?

Mr. RUDDICK: We have the same price for all our butter—twenty-four and-a-half cents, f. o. b. at the station.

The CHAIRMAN: One point I would like to ask Mr. Gould. He spoke of cutting the butter off and leaving the top smooth. I would like to ask if that is butter for shipment or whether it is intended for immediate use in the local market.

Mr. GOULD: We never could get enough butter for immediate use until within the last two weeks. We want to show a granulated surface, for that has a better appearance than when it is smoothed down and has a greasy look. Mr. Ruddick spoke of the paper drying up. Use a cloth and put salt on top, and paper on top of that, and the cloth will stay in its place. Put a cloth next the butter, then salt, then paper, and you have the thing down pretty fine.

Mr. RUDDICK: The only trouble is that we find it mighty difficult to get people to use more than one cover for the butter. For that reason we have recommended the best single cover we could get. When the salt is on the paper the paper will not dry up. The cloth will stick to the butter, but it does not exclude the air.

Mr. BLAYNEY: How many pounds of ordinary good milk to make a pound of butter?

Mr. RUDDICK: The average for December at Mount Elgin was a little over twenty pounds of milk to a pound of butter. That is milk that is up to something like four per cent. of fat. It was was 21.5 pounds at Woodstock.

Mr. BLAYNEY: What was the average for cheese?

Mr. RUDDICK: I could not tell; very few of the factories have their statements out yet.

Mr. DERBYSHIRE: How much money did you get for your butter after the regular factory season?

Mr. RUDDICK: We commenced to make butter about 1st December, and so far, we have made between $1,200 and $1,500 worth. From this date we will make far more. At Mount Elgin, for instance, December is the largest month, because they have not as many fresh-calved cows coming in as they have at Woodstock. At Woodstock they have pretty well got into the idea of having cows come in the year round. The quality of the butter at these winter dairy stations will improve right along as the farmers get into the way of having cows come in all the year round. When we commenced we found we had to work mainly with the milk of strippers, and the butter did not have the fine flavor of the finest goods.

Mr. DERBYSHIRE: The reason I asked the question was because I wanted to know how your section compared with ours in this respect. We stopped making cheese on the 15th November. I tried hard to get the factory to quit on the 1st November; I believe that is as late as cheese ought to be made.

A Voice: What factory?

Mr. DERBYSHIRE: The Elgin Model. They had cheese contracted for at high prices, to they did not commence making butter until the 15th November. Up to the first week in January I had bought and paid for $4,000 worth of butter. That is for the butter made in the balance of November after the 15th, the whole of December and the first week in January.

Mr. RUDDICK: I am glad to hear him say a word for the Elgin dairy, because it is one I had a hand in getting started.

Mr. DERBYSHIRE: You must not suppose that is the only factory we have. We have five running at this time, and though the Elgin Model is the largest, the others have run $3,600, $3,700, and $3,200. The smallest factory we have has taken in $2,000 in money since the regular factory season closed. And we are just commencing the winter dairying business. You have no idea what we shall be doing next year.

Mr. RUDDICK: It is necessary to explain that the creameries in this part of the country, especially Mount Elgin and Woodstock, are not making as much as when they started, simply because the cows have dried up early to come in now. We are going to make more. The new factories make more just at the close of the cheese-making season because the cows are milking. In the Mount Elgin creamery for the three weeks of December the patrons got $1,400.

Mr. DERBYSHIRE: I was giving the gross amount I had paid the factories for the butter. But by far the greater part of that money was divided amongst the people of that community.

Mr. DILLON: I took a few names of the patrons and the amount of their cheques for the month of December and with your permission I would like to read it:

Reuben Smith	$ 50 13	W. J. Whaley	$ 43 28
Em. Harris	45 37	Thos. George	27 02
Jas. Moulton	24 81	Thos. Prouse	116 24
C. E. Lane	63 23	Reuben Nancekivell	53 18
J. & C. Banbury	50 79	Wm. Butler	36 21
Wm. Nancekivell	32 83	J. R. Dickout	48 69
John Morrison	53 93	Alex. Hackett	39 38
Wm. Batten	25 72	Wash. Attwood	27 86
A. Tuttle	30 40		
Thos. Nancekivell	24 74	19 patrons received	$836 94
J. V. Bodwell	43 43		

The CHAIRMAN: Some people might say this was found money, money which would not have been received if the winter dairy was not in operation. I would like to ask Mr. Price, as one of the dairymen present, what he thinks about the profits of the business.

Mr. PRICE: This year my cows have commenced to come in. Last year they did not come in until March. I find that I make sufficient from the skim milk to pay for the expense of keeping the cows.

Mr. DERBYSHIRE: You don't know how it warms my heart to know that we are making such a success of this industry. You take the milk into the factory instead of carrying on the manufacture in your homes where you cannot have the necessary facilities for handling it, and where one-half the cream is lost, while the butter cannot possibly be of such a uniformly good quality as that made in the factory. I can see that we are not only to be the leaders in the manufacture of cheese, but that we are going to be first in the production of butter as well.

Mr. SAMUEL HUNTER: Will frost injure the flavor of the butter to any great extent.

Mr. DERBYSHIRE: We are not going to have any trouble with frost. Some people who are anxious about the welfare of our country borrow trouble. Make the finest butter possible and get it into the hands of the consumer as soon as possible and it will be all right.

Mr. J. B. THOMPSON: How about frozen milk?

Mr. DERBYSHIRE: I don't want it frozen. But whisper that to your patrons—just let them know—and they will bring it in the condition you want it. But our difficulty is that we have men on the weigh stand that dare not whisper a word about the inferior quality of any milk brought to them or about the condition and surroundings in which it is produced. We ought to be plain, honest and truthful and in that way we can get the milk to the factory in the best possible condition.

The CHAIRMAN: I would like to ask Mr. Dillon about that point.

Mr. DILLON: Cream that has been frozen will turn bitter and affect the flavor of the butter. People will send that kind of milk sometimes, but when we ask them they will—

Mr. DERBYSHIRE: They will just refrain.

Mr. THOMPSON: I had reference to the milk before the cream is raised.

Mr. DERBYSHIRE: Get up and tell them how you handle it, Mr. Gould.

Mr. GOULD: I was much interested in this question of winter dairying. Two little factories with us brought $3,000 a month in one township to help us out. In fact we didn't know, except by being told about it, that there were any hard times. As to frozen milk, there is no need to get the milk frozen going to the factory. It has been my good fortune to spend two winters in Minnesota, where I realized what it means to have it ten degrees below zero for the whole month of January. They gathered milk there and took it to the creamery without getting it frozen. They have sail canvas over the load. But you want to look under the canvas and you would see there a little oil stove, one with a round wick that would not throw off any scent. The milk could be carried twenty miles and never freeze. If the Minnesotan can do that why can't the rest of us catch on?

The CHAIRMAN: If you are through with the discussion of this question, I will call on Mr. Chadwick, who as you know, was for many years Secretary of the Association. He had the energy and the practical business ability to centre the industry in the town of Ingersoll and he is a man to whom this town as well as the whole Dominion owes a debt of gratitude. I am sure it will be a pleasure to you, considering the splendid success that has rewarded his efforts in the building up of this industry, to hear a few words from him.

Mr. C. E. CHADWICK, Honorary Secretary: I did not come here to make a speech as I am not at all in a fit condition to do so. Yesterday was the first time in nine weeks when I have been able to leave my room, having been laid up with that mortal enemy the grippe. It reminds me of old times to see a meeting here of those engaged in the dairy industry. It is now about twenty years since that industry began to develop, and since that time I do not know that I have missed more than one or two conventions of the Association. I can see an improvement not only in the industry but in the very people themselves. We Canadians are a people greatly blessed and ought to value highly the privileges we enjoy. I am sorry I am not in a condition to speak to you, but I hope before the meeting closes to be able to address you more at length. I can only express my appreciation of your kind reception of me and my gratification at seeing so fine a meeting.

Mr. PEARCE: As you are aware, there has been some discussion amongst cheesemakers with respect to adopting uniform rules and regulations. I think a committee has been appointed from each cheese market and these committees were to meet here during the convention. I think it desirable that the committees from these markets should meet and get the matter into some shape.

The CHAIRMAN: Mr. Chadwick's address reminded me of the grand work done by the pioneers of this industry. Another of these pioneers is Mr. Losee who, like our friend Mr. Chadwick, has been suffering with the grippe, and has not been able to be here. As secretary of the County of Oxford Association it was his intention to call a meeting of that body during the progress of this convention. But under the circumstances we agreed to merge our annual meeting in the meeting of the Association here. I am sure we regret that he is not with us.

The meeting adjourned until the evening.

FIRST DAY—EVENING SESSION.

Dr. WILLIAMS, Mayor of Ingersoll, delivered an address of welcome to the members of the Association on behalf of the people of Ingersoll. He was followed by Mr. H. S. Noxon, President of the Board of Trade of Ingersoll, who welcomed the delegates on behalf of the business interests, especially the dairying interests of the town.

The Chairman, Mr. ANDREW PATTULLO, delivered a brief address in response, acknowledging the courtesy of the citizens and the business people of Ingersoll.

THE FOODS WE EAT, WITH SPECIAL REFERENCE TO THOSE FROM THE DAIRY.

Prof. H. H. DEAN, O.A.C., was then called upon and delivered the following address:

I have two objects in laying this subject before you. First, that we should study economy in the purchase of food. To be economical is right; it is honorable. The poor man's money spent for food is not spent as economically as it should be, nor is his food served up in the way it might be. One half the struggle of life is a struggle for food. How many people there are who have not enough to eat. Statistics collected

in Germany show that the men receiving from $225 to $300 a year spend 62 per cent of their incomes in food. In Great Britain it was shown that men receiving wages of about $500 a year spent 51 per cent. in food. The figures in Massachussets show that men receiving from $350 to $400 spent 64 per cent. in food, those receiving $600 to $750 spent 60 per cent. in food, those receiving from $750 to $1,200 spent 56 per cent. in food and those receiving more than $1,200 spent 51 per cent. in food. So you see I am quite within the mark when I say that one-half the struggle of life is a struggle for food. I may say at this point that I do not claim very much originality for what I am about to give you. I am indebted very much to the reports and bulletins prepared by Prof. Atwater and Mr. Woods of the Connecticut Experimental Station. I present the facts they have given with a few original remarks and researches of my own. My second object is to show that dairy foods are economical foods. We have been studying too much, I think, the question of how to produce dairy foods economically and have not paid sufficient attention to advertising them. When a man gets up a patent medicine he fills the newspapers with advertisements. The medicine, however good it may be, will not sell itself. The same principle applies to us; we must advertise our business. We have not sufficiently advertised our goods; we have not laid before the consuming public the economy of using dairy foods. Our goods are what we represent them to be; you do not always find it so with goods you buy. Carlyle, speaking of the rural districts of Scotland, says: "Nowadays the poor bairns can't get a sup of milk to their porridge. The whole of the milk is sent up to the towns and the laborer's child gets none. The result is they are brought up on slops and the breed decays." That shows the value put upon milk by so great a thinker as Carlyle. Mr. W. T. Stead, who is creating a sensation in several ways just now, says: "To deprive children of milk is simply infanticide by one or two removes." The subject of foods and their economical use is a very important one. Hitherto scientific feeding has been studied only so far as it affects the lower animals, but when we talk about the feeding of people we meet difficulties beyond the range of our information. If I were to inspect the kitchens and dining rooms of this town, and then come here and tell you what I saw, I should need the protection of the police, because here, as everywhere, waste and worse than waste of food is going on. But the study of the scientific feeding of man has begun. The Germans, who lead in many scientific movements, have done a great deal, and the Americans also have begun to study the question. The two men I have mentioned have done a great deal in this direction. Man is an animal, but he does not feed himself as rationally as other animals do. He does not feed himself as scientifically and economically as he feeds other animals in his care—such as his cows and horses. The great satirist, Dean Swift, in his tale, Gulliver's Travels, makes the hero of those many adventures tell of his life in the land inhabited by horses. While there he was fed on oats and milk and, during his life there, was never a day sick. That was an awful satire on the feeding of men, suggesting that horses know better how to feed than man who considers himself the most intelligent of animals. Next look at the uses of foods. Their chief functions are to build up and to supply fuel. In the case of a growing person food is required continually to produce growth, and milk is, for children, the best food we can get. The grown man or woman requires food to supply wastes that are continually going on in the body. Our bodies are continualy wearing away and we must have material to build them up again. That material comes from the food we eat. It is said, I do not know how truly, that the body changes every seven years. I read of a case of a lecturer at a class in a ladies' college who, illustrating this point, said: "Miss Smith, in seven years from now you will be no longer Miss Smith, you will be changed." "Well," was the answer, "I am sure I hope so." Fuel has two chief functions, to furnish warmth and supply energy. This subject of energy will probably come up several times in the course of my talk, and we may as well explain what we mean by it—it is the power to do work, or to overcome resistance. Take a watch spring for instance. It has so much energy, and is capable of doing a certain amount of work when released after being wound up. A man walks down the street with a brisk step. He uses energy. Where did he get it? From the food he has eaten. The energy that is stored up in our bodies enables us to do our work,

and so the value of our food is to be measured by the amount of energy it contains. There are two kinds of energy: One is what we call potential energy, or energy stored up like water behind the dam, which is capable, on being released, of doing so much work. When released it will turn a wheel, and then becomes energy in motion, or actual energy —the second kind. Formerly we were told that men who were doing brain work required different foods from those who were doing manual labor, but recent investigation has shown that mental health is produced by bodily health. The man who keeps himself in bodily health and vigor is capable of doing any amount of mental work. A man who had been reading about the need of phosphorous to promote mental energy, and about the large proportion of phosphorus in fish, once wrote to a humorist asking if this was so, and about how much fish he ought to eat to produce the best results. The answer sent him was that a man of his apparent mental qualifications would require about a whale a day. But we know now that it is not necessary to feed a man who is doing mental work any differently from one who is doing bodily work. There are three kinds of workers in the world, muscle workers, brain workers, and those who do not work at all. The latter class predominate in some places, but evidently not here. In buying foods, we should consider first their cost. The cheapest food is that which supplies the most nutriment for the least money. Next we should consider digestibility. It has been truly said that it is not what we eat, but what we digest that benefits us. This is true not only in the case of man but in the case of other animals. Some men think that if they can stuff a lot of meal into a cow they will get butter accordingly. But it is not so; it does not depend upon what she eats but upon what she digests. As a rule animal foods are more easily digested than vegetable foods. I have here the percentage of elements for building and supplying energy in various foods. As a rule, the percentage of digestibility in animal foods is greater than in vegetable foods:

DIGESTIBILITY OF NUTRIENTS IN FOOD:

Animal Foods.	Per cent. digested.			Vegetable Foods.	Per cent. digested.		
	Protein.	Fat.	Carb.		Protein.	Fat.	Carb.
Beef, veal and mutton	100	95	...	Flour (fine)	85	80	95
Fish, oysters	100	95	...	" (medium)	81	80	95
Milk	100	96	...	" (coarse)	75	80	95
Cheese	100	95	100	Rye flour	78	80	95
Butter	...	96	...	Potatoes	75	80	95
Eggs	100	98	...	Corn Meal	85	80	95
				Rice	85	80	95

We buy very largely of animal foods. Why? Because, as a rule, they are more easily digested than vegetable foods. With regard to digestibility, there are three things we need to consider, first the ease with which the food is digested, second the time required for digestion, and third the effect upon the health. I cannot speak more fully of these now. The third point we need to consider in buying food is their composition. I wish to call your attention to the composition of some foods in ordinary use. Before I give you the figures let me explain what we mean by the terms used. By edible portion I mean the portion that can be eaten. For instance you buy a hindquarter of beef. About twenty per cent. is refuse, about forty four per cent. is water, and 35 per cent. is edible. That edible portion is made up of three constituents, portein, fat and carbohydrates. Protein is the nitrogenous or muscle-forming matter. I might eat all the butter I wished and still not be able to move, because my muscle comes from the protein part of food, and butter contains little protein. The fat you know about. The carbohydrates are sugar and starch. There remains some matter which could not be destroyed, even if the material were put into the fire and burned, this we call ash or mineral matter.

There is no refuse or waste matter in milk, butter or cheese. That is a decided advantage in buying dairy products. There is much that you have to throw away when you buy beef or lamb or chicken or eggs, but not so with dairy products. In tomatoes there is ninety-six per cent. water—that is only four pounds out of one one hundred of dry matter that you can make any use of. In the case of oatmeal you have no refuse and only 7.8 per cent. of water. In wheat bread there is thirty-two per cent. of water. Suppose you are going out to buy food and you desire to buy economically according to the amount of nutriment contained. You have a dollar. Now what would it be best to buy? In the list I show you—I got the prices from a lady with whom I board in Guelph—that is what she pays on the average. Of course I do not know how these prices compare with what you pay. If you buy beef at twelve and a half cents you will for a dollar obtain beef yielding 9,120 calories. What is a calorie? When you put a thermometer into a vat of milk, you notice the mercury rise. If it goes up from fifty to sixty, you say it has risen ten degrees. A degree is a unit of heat. A calorie is a unit of energy, and is equal to about one and a half foot-tons. That is a mechanical unit. By a foot-ton is meant the energy required to raise a ton one foot. Energy is the power to do work or overcome resistance. When a man goes to his work in the morning he must have energy stored up in his body in order to get through with it.

Composition and Relative Value of Table Foods:

Kind of Food.	Edible portion.							Price per pound.	$1.00 will pay for.
			Nutrients.						
	Refuse.	Water.	Total.	Protein.	Fat.	Carb.	Ash.		
	p.ct.	p.ct.	p.ct.	p.ct.	p.ct.	p.ct.	p.ct.		
Hindquarter beef	20.2	44.4	35.4	13.6	21.0	....	0.8	12½c.	9,120 Calories
" lamb	15.7	51.3	33.0	16 0	16.1	.....	0.9	15c.	6,337 "
Chicken	38.2	44.6	17.2	15.1	1.2	. ..	0.9	10c.	3,330 "
Turkey	32.4	44.7	22.9	16.1	5.9	.....	0.9	10c.	5,550 "
Hen's eggs (in shell)	13.7	63.1	23.2	12.1	10.2	.....	0.9	25c. (per doz.)	3,602 "
Oyster (solids)	.....	87.2	12.8	6.3	1.6	4.0	0.9	35c. (per qt.)	1,380 "
Milk	.....	87.0	13.0	3.6	4.0	4.7	0.7	5c. (per qt.)	16,250 "
Butter	.....	10.5	89.5	1.0	85.0	.5	3.0	25c.	14,160 "
Cheese (full cream)	.....	30.2	69.8	28.3	35.5	1 8	4.2	10c.	20,760 "
Potatoes (edible portion)	.....	78.9	21.1	2.1	0.1	17.9	1.0	.....	.....
Tomatoes (edible portion)	.....	96.0	4.0	0.8	0.4	2.5	0 3	.....	.....
Oatmeal	...	7.8	92.2	14.7	7.1	68.4	2.0	2.5c.	73,800 "
Wheat bread	.....	32.3	67.7	8.8	1.7	56.3	0.9	2.5c.	51,200 "

In a dollar's worth of oatmeal at two and a half cents a pound are 73,800 calories. No wonder these big Scotchmen who live on porridge are able to do so much work. Wheat bread will furnish 51,200 calories to the dollar's worth. So you see of all these things, milk, butter, cheese, oatmeal and wheat bread will give us the greatest return for the money expended. I wish to emphasize this particularly that you can get the energy required in cheaper form from dairy products, oatmeal and bread, than from anything else at the prices quoted. Another thing we need to consider is the amount of waste. Food may be wasted in two ways: First, by being thrown away, and second by over-eating, the latter being far worse than waste. We should have a standard of the foods we eat. What is the effect of food upon the lower animals? Take animals and put them on rough feed, and the breed will deteriorate. So men who are fed on course foods will not have as fine qualities as those who live on fine foods. A man must be well-fed in order to do the whole work of which he is capable. This is recognized in the German army. They increase the rations when the men go out into the field, and it is found that the best fighters are the best

eaters. Emigrants at New York often land in a half-starved condition. One man tells us his experience with these people in employing them in a brickyard He put them at hard labor and fed them well, and he found it paid to feed them well—they did more work, and gained on the ration fed. Prof. Atwater gives some very interesting experiences in that respect. He sent a man among the French-Canadians and he found they were eating three and a half pounds of food a day. Examination among the compatriots of these people in a Massachusetts town showed that there the people were eating five pounds a day because they were getting better wages. How much should we eat? I stated before that the subject of scientific feeding has not been studied, but we are beginning to learn how to feed men scientifically. You hear a great deal about a "ration." That is the quantity an animal will eat in a day. In speaking of what a man will eat in a day scientists call it a dietary. In a Connecticut boarding-house the dietary was 103 grammes protein, 152 of fat and 402 carbo-hydrates, yielding 3,490 calories. The proportion was a pound of protein to 7.3 pounds of carbo-hydrates and fat. That is not exactly true but it will do for my point.

I took the trouble to study the dietary of a family in Guelph, and I have here the figures for one week, beginning December 18th last. The family consisted of three men (two professional men) and four women. One of the ladies is a clerk in an office, and the others are doing housework. This Guelph family was eating too much fat, too much sugar and too much starch for a scientific dietary. Below here on the chart I have what we call a standard dietary :

Dietaries. (Quantities per day per man.)	Nutrients.			Potential Energy.	Nutritive Ratio.
	Protein.	Fats.	Carb.		
	Grains.	Grains.	Grains.	Cal.	1
Boarding house men (machinists)	103	152	402	3,490	1.3
Av. 5 dietaries of professional men and students	126	152	489	3,925	6.6
Mechanics in Europe (Voit)	151	54	479	3,085	4.0
Professional men and students (Europe)	114	111	285	2,670	4.7
Guelph family	105	134	417	3,386	7.1
Standards.					
Adult in full health, Playfair	119	51	531	3,140	5 5
Man at moderate work, Wolff	125	35	540	3,030	4 9
Man at moderate work, Atwater	125	125	450	3,520	5.9

This standard dietary would be supplied in 10 ounces lean beef, 10 ounces bread, 4 ounces butter and 25 ounces of potatoes. What is the reason we do not live on bread, beef, potatoes and butter? Because we like variety. If you were to run a boarding house on bread, beef, potatoes and butter you would not keep your boarders long. What I want to emphasize is that we eat too much fat, starch and sugar. We want more protein in our food. I think it was Mr. Adams, of Wisconsin, who said that milk gives more comfort than tea, more strength than coffee, more fat than beer and more sense than whiskey. I think he was about right. Milk is an economical food, and one suited to our wants. It is said that butter contains the fats and oils needed for the brain. Some men's brains need oiling very frequently. For such I would recommend butter. Cheese is wholesome and digestible. You may think I am treading on dangerous ground, that cheese is not digestible. It depends on the man. If a man's digestive system is in fair condition he can digest cheese. What a fine thing cream is! Add cream to the things you eat and it makes a great improvement. In conclusion, I wish to mention five principles which should be observed in buying and using foods :

1. Buy foods which will afford the most nutriment in the most digestible form for the least money.

2 The supply of food should be equal to the expenditure in the body. The nutrient elements should be in proper proportion. We eat too many pies and cakes.

On the table of the ordinary farmhouse, particularly if they know you are coming, you will find two kinds of pie and four or five kinds of cake. And if you don't taste every one of them the lady of the house thinks you think they are not good.

3. Waste should be reduced to a minimum. In the case of one boarding house investigated by Prof. Atwater, enough protein was wasted to supply a man with protein for 112 days, with fat for 112 days, and enough carbo-hydrates to supply a man for 30 days.

4. If nothing were wasted and each person ate only enough to keep the body in a healthy condition, there need not be any hungry people in the world.

5. Dairy products supply material for growth, repair of the bodily wastes and energy to do work in a digestible, palatable and cheap form. This last is the most important thing, and I wish to impress it on your minds.

The CHAIRMAN: I am glad that I am now able to retire from the position I have occupied, for Mr. Geary, your President, is here.

Mr. GEARY, the President, on taking the chair, said: It was with a great deal of regret that I found waiting for me on my arrival here a message calling upon me to return to London. I was not able to get back to Ingersoll until the evening train. Let me congratulate you upon the attendance here to-night. I congratulate the town of Ingersoll, also, upon this success. This is the best initial day of any convention I have ever had the pleasure of attending. This is the first convention I have had the pleasure of attending here, but I hope it may not be the last. It is not my intention to detain you. I shall now call upon Mr. A. T. Bell, of the Tavistock Dairy School, to read his report.

THE TAVISTOCK DAIRY SCHOOL.

Mr. A. T. BELL read the following report: I take pleasure in submitting to you my third report of the work done in connection with the Tavistock Dairy School. The executive of this Association deemed it advisable, owing to the fact of their being so many inferior cheese made in the early spring, to have four factories set apart in different districts where cheese-makers could go and receive instruction in the making of early cheese; in short, to bring instruction as near home to them as possible. The Attwood factory, near Listowel, was chosen as one of these factories, the executive appointing me to take charge and give instruction. While there I met with a goodly number of cheese-makers, notices having been sent out advising them of the arrangement made and urging them to take advantage of this mode of instruction. All that I met while there seemed to be of the right material, anxious and willing to take advantage of anything that would be the means of improving the quality of their cheese. I was more than pleased to note the interest take in the cheese business by the patrons of that factory. They signify their willingness to adopt any change or make any improvements that would be necessary to raise the standard of their cheese. Mr. Grey, their cheese-maker, is fully alive and abreast of the times, a combination which cannot fail to succeed. Withal, my short stay at the Attwood factory was of the most satisfactory character, and I trust the results have been the same. It may be well here to note some of the essentials in the manufacture of early spring cheese, as practised by us and taught at the Attwood factory. After receiving the milk and heating it to the desired temperature, 84 to 86° F., apply the rennet test to ascertain the condition of your milk, and be sure and set your vat in time to ensure a thorough good cook on the curd, which takes ordinarily not less than two and a half hours from setting until dipping. Double the ordinary quantity of rennet should be used, or enough so that the vat will be ready for cutting in from fifteen to twenty minutes. Coagulation being very rapid, it will be necessary to start to cut a little earlier than usual. Use the horizontal knife first, cutting continuously until finished. After cutting, stir the curds very, very gently for ten minutes or so before applying the

heat. Raise the temperature to 98°, taking a full half hour to do so, if the milk is working all right. At this stage draw off part of the whey, so as not to be caught with a too rapid development of acid, stirring the curd sufficiently to keep it from matting. Draw off all the whey on the first appearance of acid, or at that stage that when the curd is dipped into the sink and stirred sufficiently it will show about one-eighth inch of string on the hot iron. Turn the curd over at intervals for the liberation of the whey, as whey should never be allowed to lodge around the curd while in the sink. Keep up the temperature of the curd, if possible, to not less than 94°, until it is ready for grinding, which is when it will string about three quarters inch on hot iron. After grinding, stir sufficiently to keep it from matting until ready for the salt. This is known by a mixture of oil and whey seen very distinctly coming from the curd when taken up and pressed in the hand. It is not always desirable to wait with spring curd until it has that nice velvety feel known to cheese-makers. Salt light, say from one and a half to two pounds per 1,000 pounds milk, according to condition of curd. Put to press when salt is dissolved, pressing very, very carefully at first, or until the whey runs somewhat clear, when all the pressure can be safely applied. When taken to the curing room next day, see that the temperature of the room is about 70°, and maintained as near as possible to that for your early cheese. Now, in summing up, there are five very essential points which must be practised faithfully to ensure success: 1. Use a large amount of rennet. 2. Cook the curds well. 3. Guard against too much acid. 4. Use sparingly of salt. 5. Keep up the temperature in the curing room.

Our work at the School commenced on the first of May, the arrangements being the same as in previous years—all instruction free to those who attended. Pupils were allowed to come and go as they chose, and as a consequence of this the time of attendance varied very considerably, from one to ten days being the limit. The attendance at the School was not so great as in previous years, owing, no doubt, to the fact of so many of our cheese-makers attending the Dairy School at Guelph last winter.

I feel satisfied that the interest in cheese-making is deepening, from the fact that nearly all of the cheese-makers who attended the school this past season, and others with whom I came in contact, showed more of a spirit of enquiry than formerly, and that may readily be accounted for from the fact that the more we know the more we want to know, and this holds good in the cheese business as well as in anything else. The system of paying for milk according to quality was adopted at Tavistock this past season with most satisfactory results. This gave rise to many enquiries from those who attended the school. It seems to be the leading question among dairymen at the present time. There has been a little dissatisfaction in some places with the system, but I feel confident that the system is not to blame for it.

In many instances those sending poor milk have been its enemies; in other cases it has been the want of careful and intelligent manipulation on the part of the operator. But we must all remember that perfection is not reached in a day. In starting any new business or project, there are always some little things coming up which are an improvement. Now, I may say that we have learned a great deal this past season about the business, and expect to learn a great deal more. Just here it may be well to mention some things which are necessary to practise in order to get satisfactory results in testing. First find out the strength of your acid by testing some samples beforehand. We will take it for granted that the composite test is being used, as I think that is chiefly practised. In adding the milk from day to day, shake the jar very little, and that little a circular whirl; better to have some of the cream stick to sides than churn it by shaking. Just a short time before making the test, place the jars in hot water, which causes the cream to leave the sides more readily. After giving jars a circular shake, empty into a convenient vessel and take samples at once. Be careful and pour in the acid slowly, letting it run down side of test bottle, otherwise it is apt to char the fat and blacken the reading. Again, the temperature of the milk has to be taken into consideration; if too hot, the readings will be black, if too cold there will not be a complete separation of the fat. Hence it becomes necessary in cold weather to either keep the jars in a warm room or place them in hot water to warm up the contents before making the test. I think the idea that some had of this acid varying so much in strength was

due largely to the variation in the temperature of their milk. Always place bottles in the machine for whirling very soon after acid and milk is mixed; if not prepared to do this, place them in hot water until ready to whirl. After giving them the required number of revolutions, add part of the water at about 170° F. Whirl one minute, then add water, filling up to about mark 7; whirl another minute. Be careful, in adding the water, not to get it above the graduated part of the neck. On taking bottles from the machine, place them in a tin or box for the purpose, containing hot water, keeping the water deep enough to cover the fat, and then the readings will all have the same chance. If care is not exercised here, there is a possibility of injustice being done, owing to the fat contracting very quickly when exposed.

We conducted some experiments the past season to ascertain the yield of cheese from different qualities of milk, which confirmed those made in the two previous years. I am satisfied that the system of paying for milk according to quality is right and just. As to the different modes of manufacture and of manipulating the curd, we do not think it necessary to conduct any experiments at length, other than from our everyday work. After all that has been said and done, the good old way which has been preached for years has not, to my knowledge, been superseded with a better. I am satisfied that what we want now more than any one thing is to have the milk well cared for, so that it will arrive at the factory in the best possible condition; not that we have arrived at perfection in the art of making cheese, by any means, but I believe we are nearer that goal than the patrons are in caring for their milk. And I do not know of any surer way of reaching that desired point than by adopting the system of paying according to quality. It is the testimony of all cheese-makers where this system has been adopted that they get better milk, and that alone should be a sufficient incentive for all to adopt it. I think now especially, more than ever, there should be greater efforts put forth by patrons and cheese-makers to attain perfection in the handling of the milk and in the manufac- of the cheese, for after the tremendous drubbing our neighbors across the line have received this past season it is hard to say what they may do in future to gain supremacy, so let us one and all, patrons and cheese-makers, be united in this great work.

We made some changes at Tavistock this past season in regard to a starter. The name may not be familiar to some, and for the benefit of those I would say that it is a little milk kept over from day to day when the weather is cool, and allowed to change, to be added to the milk delivered at the factory if it is too sweet or working too slow for the application of rennet after it has been heated up and tested with the rennet test. All cheese-makers will agree with me that in order to have the best results we must bring the milk to a certain point in the ripening process before the application of rennet, and it happens quite often, especially when the weather is cool, when milk, as a rule, is sweet or when it is gassy that it takes considerable time after heating up to bring it to the desired condition for the application of rennet. I have found, by being as careful as possible, we would lose considerable fat by waiting so long before setting, so in order to get over the difficulty we keep a little starter for use if required.

Our method of preparing a starter is as follows: First provide a suitable can or vessel with close fitting covers for keeping it in, for it will not do to have it exposed to taints or impure air, which is too often found in factories. The can we used and found satisfactory was made to order as follows: In capacity about 25 gallons, made double with about one inch hollow space all around; two covers, one fitting closely inside, with flange to keep it from getting down to the milk, the other covering over all and fitting close to outside of can. The inside wall was tin, outside galvanized iron. By having hollow space the milk in can was not subjected to changes in temperature caused by surrounding air. How to prepare a starter: First spot the patron who is sending the best cared for milk that comes to the factory—milk which has been well aired and free from any foreign flavors; save about fifteen or twenty pounds for each vat; see that the temperature is about right—we recommend about 65° or 70°. Now take a little of the previous day's starter, add it to what has been set apart, stir it in well, then add nearly as much pure cold water as you have milk, stirring and mixing thoroughly. Cover up tight until you require to use it. It will appear somewhat thick, but it is not like common thick milk; pouring once or twice from one pail to another will break it up and

liquify almost like normal milk. I must throw out some warning as to the use of this starter. Do not put it into the milk until you are sure you will need it, that is after you have tested vat with rennet test, unless the weather is very cold and you know that all the milk being delivered is perfectly sweet. Then again make three or four seconds difference in your rennet test when using starter, if you are setting at twenty seconds without starter set at twenty-three or twenty-four seconds when using it, for we must set in time to insure a good cook on the curd. I always find I need, in ordinary practice, about three hours from setting until dipping, and sometimes have to cut curd a little fine even then. I am satisfied that a good clean flavored starter used intelligently is a great benefit, on the other hand a poor flavored one should never be used under any circumstances for it will spoil the whole batch.

I do not think it wise to extend this paper. I might continue about cheese and cheese-making, but that has been thrashed out pretty well, and I find, as a rule, where there is faulty cheese it is not so much the want of knowledge on the part of the cheese-maker as the indifference and want of application to make use of it.

And now, in conclusion, I would urgently request all cheese-makers to be more watchful with the milk. Reject any that you know will in any way injure the quality of their cheese, using nothing but the best material in the making. Never use any material simply because it is cheap; it may cost you many dollars in the end. Look sharply after all details, and never forget to preach to yourselves and patrons the two great essentials, cleanliness and aeration.

A LETTER FROM MR. FOSTER.

The PRESIDENT: The hour is growing late, and I would like to hear some discussion upon Mr. Bell's excellent paper. But first let me read this letter from a gentleman in a sister Province. I admire the style of the letter very much, and I know it will be pleasing to all of you.

KNOWLTON, January 18th, 1894.

J. W. Wheaton, Esq.,

MY DEAR SIR,—It is with sincere regret, I can assure you, that I write to say that owing to the condition of my health it will be impossible for me to accept your kind invitation to attend the Annual Convention of the Dairymen's Association of Western Ontario. I am very sorry indeed, as I had been looking forward, since receiving your letter, with the hope that I might be able to join you on this occasion, as I am most anxious to form the acquaintance of the Ontario dairymen in order to cultivate a feeling of friendship and co-operation between our Provinces. We, in the Province of Quebec, feel under great obligation to you, our brother dairymen of Ontario, for the example and lessons you have taught us in co-operative dairying; and we are happy to admit the fact, that without which, and the guidance of Professor J. W. Robertson, our Province would never have won distinction at the World's Fair in dairy products. Canadian cheese has taken a position surpassing all other exhibits from this Dominion at the World's Fair, and we must not forget the fact that if we expect to profit by what has been accomplished it will be necessary for us to work together and keep the standard of Canadian cheese where it is to-day. With Professor Robertson's guidance there is no difficulty about holding this position, which will bring many thousands of dollars to this Dominion, and be the means of keeping our young men at home, a most important consideration for the older Provinces. Our confreres of the Western Dairymen's Association may rest assured that they have the best wishes and confidence of Quebec dairymen, and the hope that all schemes for the advancement of this great industry will be jointly shared.

With the deepest regret that I cannot attend and join in the discussion at this important convention

I remain, yours always,

H. S. FOSTER.

Mr. PATTULLO: The President has kindly released me, not only from occupying the chair but also from delivering the address for which my name appears upon the programme this evening and which can be as well given at some other time. I desire, therefore, to say a few words with reference to the letter you have just heard. Mr. Foster is not known personally to many of us here. I have never had the pleasure of meeting him myself, but I have heard much about him and know a good deal of what he has been doing. He is a man who has taken a tremendous interest in this dairy industry in Quebec, and has done much to bring it to the position it occupies to-day. While I should be sorry to see Quebec win the laurels from Ontario—they shall never do that—we cannot but admire

the manner in which they have taken hold of this industry of cheese-making in the last two years. A great deal of their success is due to the energy of Mr. Foster, who has thrown himself into the movement with the greatest vigor. This is all the more singular from the fact that he is a blind man, proving that if he does not see with his eyes his mental vision is keen and strong. I am sorry indeed that he is not here. You remember that at the last Industrial Exhibition there was rivalry among associations of Eastern and Western Ontario and Quebec. Mr. Foster and his friends came on with a car load of cheese expecting they were going to beat Ontario completely. But some of us, knowing what was coming, hustled round and managed to make such an exhibit at Toronto that we beat them two to one, and asserted again our right to be regarded as the banner province in dairying. But while we have beaten Mr. Foster and our friends in Quebec we should have been more than delighted to see him I am sure. It is only due to him that this explanation should be made.

Mr. WILLIAM MONKSWELL: I would like to ask Mr. Bell if any changes have been made or are likely to be made in the system of paying for milk.

Mr. BELL: It is not decided whether we shall continue the system on the same basis or not. We are to have a meeting on the 1st of February to decide, but I think that in all probability we shall continue.

Mr. MONKSWELL: You have, during the past season, paid for milk according to the butter fat test?

Mr. BELL: Yes.

Mr. J. W. COPELAND: Have you noticed in those factories where the Babcock test is in use any improvement in the milk?

Mr. BELL: At Tavistock we found it a little higher this year than last. I expected a better average in July than we actually got. The flies were very bad and irritated the cows very much.

Mr. COPELAND: What was your average for the season?

Mr. BELL: It was 10.7.

Mr. D. LEITCH: How often did you make the test?

Mr. BELL: Once a week.

A MEMBER: Did you keep the bottles in ice water?

Mr. BELL: No; on the shelves.

A MEMBER: What is the cost of the apparatus for a factory of about 100 patrons?

Mr. J. S. PEARCE: About fifteen or twenty dollars. The bottles cost eight cents each and the bi-carbonate twenty-five cents a pound.

Mr. DERBYSHIRE: There should be a case for these bottles divided so as to give a place for each bottle into which it will exactly fit. It should have a lock and key and should stand close to the weighing can. Our experience is exactly the same as that of Mr. Bell. Where the Babcock test has been used it has taken less milk to make a pound of cheese than in other factories. The reason is that no patron gets paid for water or skim milk.

Mr. WILLIAM DICKSON: In our factory we have adopted the plan of adding one per cent. to the test. For instance if milk shows three per cent. in the test we call it four, if four we call it five. Our factory has been running that system during the past two years, and we intend to continue. I understand that the Black Creek factory has adopted that system. I believe the idea originated with Robert Ballantyne. They considered that a man sending in 3 or 3.30 was not getting justice, because the increase in the production of cheese was not exactly in proportion to the increase in the butter fat. By adding one per cent. it brings them a little closer together.

A MEMBER: Why does the Babcock test increase the average?

Mr. PEARCE: It is not merely a question of increasing the average but of doing justice. It is not fair that the man who sends in three per cent. milk and the man who sends in four per cent. milk should be paid on the same basis. I think Mr. Gould could throw some light on that question.

Mr. GOULD: Mr. Pearce has expressed it exactly. The question is not whether it will make any more cheese. It won't add anything to the milk, but it will tell what solids are in the milk and will enable you to pay each man for the solids he brings. That is what we want to get at. Now comes another question about the sliding scale. Why should we add one per cent. to the three per cent. milk? It won't make any more cheese in proportion than the five per cent. It has no more casein in proportion than the five per cent. milk has.

Mr. BLAYNEY: If the one per cent. is added for the benefit of the three per cent. milk, can't the four per cent. man bring his milk down to three per cent. by adding water?

The PRESIDENT: Prof. Van Slyke has made an exhaustive study of this matter, and can throw some light on the question.

Prof. VAN SLYKE: I do not want to anticipate what I am going to say to-morrow afternoon. But there is one source of error in the use of the Babcock machine that has come to my attention. I knew the thing was possible, but I had never known it to occur in actual factory experience. You all know that the completeness of the separation of the fat from the rest of the milk depends upon the rapidity with which the bottles revolve. If they are not whirled rapidly enough the fat will not be separated completely. If you use a machine with a belt and the belt gets a little stretched there will be lost motion, so you cannot tell exactly how many revolutions your machine is making. It has been found that milk really containing three and a half or four per cent. has fallen short as much as half of one per cent. The only remedy, of course, is, if you have a belt machine to keep the belt tight, or if you have a friction machine be sure your rubber is kept renewed. What is still better, if you have a hand machine, is to have one that is run by cogs. What is best, if practicable, is to have one of these turbine machines run by steam, the motion of which can be depended upon if you know the pressure of your steam. With reference to the justice of paying for milk according to the butter-fat, I dwelt upon this point last year, and I proposed to spend considerable time upon it to-morrow, giving the results of much more extended study than we had been able to give it up to that time.

Mr. GOULD: One question—when you add the water have you found it of value to put a little sulphuric acid into the water?

Prof. VAN SLYKE: No; that is a new suggestion to me. But I presume you all know that at the World's Fair where the method was frequently tested, they found they got better results by adding the water in two portions instead of one.

Mr. GOULD: In my experiments, when I added a few drops of acid it seemed to me I got a better and clearer reading.

Mr. J. W. SCOTT: Even if there was the difficulty of which Prof. Van Slyke spoke, it would apply equally to all the patrons, so, in reality, no injustice would be done.

Prof. VAN SLYKE: But if the person making the test does not know there is lost motion he may run the machine a little faster or a little more slowly. It introduces an element of uncertainty which might as well be avoided. Of course if all the patrons were in the same run it would make no practical difference. But it is possible for us to have absolute control in this matter, and we might as well have it.

Mr. SCOTT: Would Prof. Dean recommend dairymen to use as much cream as he professes to?

Prof. DEAN: Yes; I would recommend them to use all the cream they can. Too many farmers send their cream to the factory and compel their families to use skim milk.

Mr. SCOTT: Is there no opportunity of beating the Babcock test?

Mr. DERBYSHIRE: In a skilful hand, no. It can be read as distinctly as you can read the figures on this chart. All our dairy work must be done by skilful people. It is the most important industry we have in the Province of Ontario, and it has been brought to its present position by this Association in co-operation with others. I can remember how our good friend Mr. Ballantyne used to talk to us about the dairy school. He showed the necessity for well-trained men to handle our business in the cheese factory. As a result of this agitation we have the Dairy School to-day an accomplished fact and an important part of the Agriculture College, and I can assure you that the young men who went through this school last winter and received their education there free of charge did better service—their work showed better results at Chicago—than ever before. They are better able to educate their patrons in the best methods of keeping and feeding their cows. Every cheese factory ought to be an educational centre, spreading knowledge among the farmers in its section. Our product is about as good as we can expect to get until we educate the people to bring to the factory a better quality of milk in twice the quantity. The selection of the dairy cow has been talked about at these meetings a hundred times, and yet in how many cases in this country are cows kept that do not give a profitable return. What can be more beneficial to a man than the study of his own business? In our case it would result in improving our own condition and improving the character of our animals from generation to generation. I am glad to see the spirit of this meeting. I am sure it must result in great good all round.

Prof. VAN SLYKE: I want to sound a note of warning. The same disposition that opposes the introduction of the Babcock test into these factories is the disposition that lost to New York the victory at Chicago.

Mr. DERBYSHIRE: You couldn't have won it anyway.

SECOND DAY—MORNING SESSION.

Upon reassembling in the morning the attendance was found to be most encouraging.

The PRESIDENT, after calling the meeting to order, introduced Mr. John Gould of Ohio, who delivered an address on the subject

MY PRACTICAL EXPERIENCE WITH THE SILO.

Mr. GOULD: What I say this morning with regard to the silo shall be my own practical, everyday experience, not only for the present winter but for the last nine years. In 1885 I built the first wooden silo, I think, west of the Alleghany Mountains. I was roundly denounced as "a fool" for so doing. I was told that nothing would keep in a wooden silo. But the little wooden silo of 1885 has now about a hundred thousand imitators. And not only has the wooden silo imitators in "America" (and the expression I heard yesterday applied to the United States, just as if Canada was not in America) but Canada also has adopted the wooden silo to her manifest benefit. The farmer has arrived at a point in his practice where he stands at the parting of the ways. He now must change his methods and become a manufacturer. He must stop mining material from the ground, and selling it as raw material to some one else to manufacture. If we raise a crop, we must get the complete result out of that crop. In the States, I sometimes put it in this way. I spend all summer raising food to keep cattle alive during the winter. Then I feed the crop to the cow; she does not give me in the winter a cent of income and, in the spring, she is worth about what she was the previous fall. We feed pigs that weigh just about as much in April as they did in October. We feed surplus horses that don't bring us in a cent, nor can we sell them at any price. That simply means that I lose my labor of feeding and the crop as well. In the States last year we raised seventy two millions of acres of corn. The cornstalks of that immense area were wasted, except possibly ten millions of acres that were cut up and fed to cattle. If that material was saved and properly fed it would pay the national debt in five years. Can we as

farmers afford to raise crops for the fun of feeding them to animals that are worth no more in the spring than in the fall? I'll tell you another thing I often tell them in the States. If the constables had shot half of the horses we had on the first of December, the farmers would be much better off next spring, for to feed $25 worth of hay and corn each to horses that in the spring you must if at all sell for "six dollars a dozen," is an industry (?) that even our "Willson Bill" would fail to develop into a paying or profitable business. In regard to this great crop, we are putting too much work on this greatest of all our crops and getting too little out of it. I want to see if we can't save that corn crop and feed it in such a way that there will be very little wasted, and feed it under conditions that will give the farmer 365 profitable days in the year. We have got to become manufacturers and run our machinery 365 days, and stop "woodchuck" farming. What does the woodchuck do? All summer he gathers cloverheads and lays them away as fat on his body. In the fall he goes into his hole and through the winter lives on what he has laid up, then comes out in the spring to do the same thing over again. There is no profit in that! I said I wanted to talk from the practical standpoint. I can't talk as the professors do. They are grand teachers, and have done ever so much to help us. But after all every farmer must run his own experimental station. In the experience of the last year ten years I have learned some things about the silo. In 1885 I concluded that there must be a change in my farming, that dairying must be practised the year round. But when it came to a question of building a fifteen-hundred dollar silo, I hadn't the money, and did not know of anybody that wanted to lend me the amount. So I concluded to build a wooden one. Nine years ago there was very little silo literature. We had Dr. Bailey's dictum that we could grow ninety tons to the acre by sowing four and a half bushels of corn to the acre, and dragging it in. We did not get ninety tons of ensilage, but we did get twenty-five tons of greenness and water. We found the cows ate it, but found that we got very little milk. The more they ate the more they wanted. They would eat until they swelled up like baloons, and then would look over the fence with longing eyes at the straw stack. (Laughter.) I did not know then that in spite of their distended stomachs they were hungry. They were like the boy away back in the "thirties" when the mill to grind the corn consisted of two stones turned by hand. He took his grist to be ground and awaited his turn. After waiting a long time he began to grow impatient and asked when his grist would be ready. The miller told him he must wait his turn. The boy looked at the miller a second and then said, "Mister, I can eat corn faster than this old mill will grind it." "You are a mighty smart boy," said the miller, "but how long could you keep it up?" "Well," said the lad, "until I starved to death." Next year we went to the other extreme. Instead of sowing four bushels, we planted eight quarts to the acre. The neighbors said I had again made a fool of myself. Your neighbor is always more interested in your affairs than he is in his own business. I took care of the corn as I would my field corn and made twenty two-horse loads of corn to the acre. I put it into the silo and it made excellent silage, but not what I wanted. The question with me then was why did not my Virginia corn have ears, when my field corn did. I very soon found that it was the cultivator that was the enemy in the cornfield. Every time the cultivator went through the Virginia corn it cut the roots, and set back the growth a week or ten days, so when I got ready to cut it for the silo the silks had only begun to appear. Now, we "shoot the man on the cultivator" if he allows it to go more than one inch in depth. After I quit cultivating so deep as to cut the roots I got as much corn on the Virginia, as on the field corn. Then came another thing. My neighbors told me that Virginia corn was no good, that I ought to raise field corn. So we raised field corn to please them, and not to please ourselves. The result was we did not get nearly as good ensilage, it did not keep nearly as well, the cattle would not eat it up nearly as clean, and there was waste all the time. Let me tell you that I am speaking about things as I find them on the other side of the lake, and about twenty miles away from it. I am not going to say what or how you should plant here. We know our wives are economical in the use of sugar in making preserves, but if your wife thinks the fruit won't keep, in goes another teacupful of sugar, McKinley or no McKinley. She knows that sugar has antiseptic, or keeping qualities. The Virginia corn has more sugar in it than any other. A good acre of white Virginia corn has nearly three thou-

sand pounds of sugar, but an acre of the best field corn has only about six hundr pounds If we can get the ears to grow to the ripening stage—to the glazing stage—we get it when it has the sugar to help us in perserving it. And so we get our ideal ensilage by planting Virginia corn like field corn and cultivating it an inch deep. It will keep, and the cattle will eat it up clean because it is rich in sugar, and so we get the best results in two ways. Another thing we had to learn was that it did not pay to cut corn too soon. We were told that as soon as it tasseled and the silks came out to cut it down, and wait until we could get it into the silo. We had to go back to the experimental stations, and have them tell us this was a mistaken idea. We now leave the corn standing until we are ready to put it in the silo. The man who raises a field of corn and does not save his stalks in as good feeding condition as he does the ear is wasting food material. The stalks on an average acre of corn represents 2,600 digestible food units and the ears only 2,300. So the man who wastes his cornstalks does himself not quite as much justice as if he saved the stalks and shovelled away the ears. The cornstalk is simply the corn ear diluted. There is very little difference in their feeding value.

A MEMBER: What other things did you use for silage?

Mr. GOULD: I had good success in clover, and fair success in millet. Next year as a test I shall put in peas and clover. We are not as successful as you in raising peas. We have mildew and peas that dry up. But I think we have discovered the secret of raising peas on the other side. We sow the peas on fresh-turned clover sod and plow them under 4½ inches deep. Here comes another thing. I doubt if it pays a man to husk and grind corn and feed it. When it comes to the grinding and husking I don't know how much it costs me. I know the Ohio law says the miller is entitled to one-tenth. I have put the question as to the cost to farmers and I have got answers all the way from one-tenth to two-thirds. At one of the institutes a man said if he got his bags to carry home he was "tickled to death." The time has come when it won't pay us to go to the expense of husking and grinding that corn for feed. But the silo is the means of saving all. We can put the feed before the animals at the actual cost of labor. Close experiments are showing that the man who takes corn in the shock cuts it up in half-inch lengths and feeds it to his cattle gets better results than the man who goes to the trouble of husking and grinding. Having raised the crop fit for the silo, in 1885 I built the silo and built it of wood. That one was much more costly than it would be if I built it now. Still it was not very expensive. It was built in one corner of my barn. My neighbor said: "don't put a silo in the barn, the ensilage will rot it out in three years, and will destroy the barn in five years." That man has objected to every advance that farming has made. When the silo was invented he said it would kill the cattle. When we took to dairying he said the market would be overstocked and butter would become so common that nobody would buy it. Then when we began to stable the cows he said it would not do to keep them in the stables more than a few hours a day, it would be so unhealthy, and when we kept them twenty-four hours a day in the barn he knew they would die. But somehow those cattle are all right to-day. His idea was that cows must be hardy. I saw one of those hardy cows in Minnesota. She was extremely hardy. She was leaning up against a strawstack frozen as solid as a brick. With regard to this silo we have reduced the expense until we can build a silo in a barn that will not cost more than fifty cents for each ton of storage capacity. I have two silos in my barn, one built in 1885 and one in the fall of 1889. The first one cost me at the rate of a dollar a ton of its storage capacity. I used very expensive lumber tongued and grooved, the best flooring I could buy, and I put in a concrete foundation for a floor. In 1889 when I built the next silo I built it of cull pine lumber that cost me $11 a thousand, surfaced on one side only. I simply made a box without top or bottom and set it on the ground. I did not put in a concrete floor. For a foundation I dug a trench ten inches deep put in a 10x10 inch sill and made it firm with hydraulic cement.

A MEMBER: What nails did you use?

Mr. GOULD: I used wire "20." I coated it with tar paper, and painted it with gas tar and gasoline. Then I dug up the ground in the centre and banked it up against the

sides thus making a dishing bottom. Why? First, because I got an air-tight foundation, and then I avoided part of the pressure against the lowest part of the wall when the silo was full.

Do not get dozey lumber. Get cheap lumber but get that which is sound. Don't undertake to melt the tar and put it on hot because it will get cold the moment it strikes the cold board. Make it thin with gasoline, or coal-oil. Paint it on good and thick so it will run into the cracks. We find this to be the best and cheapest silo, and it does not show signs of wear any more than when it was first built. In our first silos we thought it necessary to be at great pains to guard against frost. But we did not know that the heat in the silo would keep up to from 80 to 95 degrees all winter. The silo is its own best protection from frost. We did find that in very cold weather it was of great advantage to put some straw across the top to keep the cold from getting down into the pit, and to keep warm air from escaping. But we found this was not only a good thing in cold weather but a good thing in warm weather as well. I found I could feed as much in the summer as in the winter, provided I took off about one inch a day from the whole surface. That settled the question of feeding ensilage in the summer. I have seen another kind of silo which I think is a good one. Instead of two thicknesses of boards it has only one. This single thickness is of the best pine flooring. In building put each board with the tongue up, then before putting on the next apply gas tar and gasoline in the groove and then the next board put on will make an air-tight joint. Don't use paper with a silo of this kind. If you do, the moment the boards get warm the paper will drop away and behind every board you will have a little ventilator. I think the best silos to-day are those that are not very large, say 12 by 15 feet inside and very deep If possible make the silo thirty feet deep The best silo I ever saw was forty-five feet deep and twelve feet square inside. You have not so much surface, but you have the enormous pressure of the great column that packs the material close and insures it keeping. I have seen the ensilage at the bottom of a silo so hard packed that digging into it with a pick was like striking into clay. You can depend upon it keeping where there is great pressure above. I find that there is a down pull to the ensilage which I do not pretend to explain. I find it gets solid a very short distance under the first layer. I would try to remove the surface of the ensilage every day. In that way the ensilage is always fresh. I think the silo will be built in the barn more generally than hitherto, for the reason that our feeding is then all under one cover. We can put seven times as much feed in the silo as we can green feed in the same space, and two tons of good silage is worth as much to feed as a ton of the best hay. Another thing, we find our silos last longer than we at first supposed they possibly could. My first wooden silo has been filled eight times and I cannot see but that it is as perfect as when it was built. The boards seem solid, and the framework has never sprung. I can't see a crack in the walls or a rotten place. The other silo has been filled five times, and is fully as solid. So I think I am perfectly safe in saying we can build wooden silos at a cost not to exceed fifty cents a ton of their storage capacity. My last silo will hold a hundred tons and it cost me $42. I paid for the labor at $1.50 a day. I worked with the men and credited myself also with a $1.50 a day; My wife said it was the most exorbitant charge for labor she had ever heard of. (Laughter.) My neighbor has a silo built of stone. It cost him nearly fifteen hundred dollars to build and finish it, and he has put more repairs on it than both of mine cost. He put a hundred dollars of repairs on it the first year and he has been tinkering at it ever since. My silos have never had a cent of repairs. One silo cost me $42 and the other $60. The $60 silo might as well have been built for $30. One of the most important points is filling the silo. A man will say: I believe in the silo, but I can't screw up my courage to team in water when I might as well team the stuff in dry. But a ton of ensilage weighs no more than a ton of hay and you can put twenty-five hundred pounds of green fodder on a wagon more easily than you can lift the same weight of hay over your head on a fork unto the wagon. My first year with the silo I did not know how to go to work and my neighbors didn't know, but they could come over and sit on the fence and criticise. And it didn't help matters when they said they would come round in the spring and help me to haul out my vegetable manure. They knew about that; they knew t would not. It was just a little silo holding 90 tons. We raised five times more corn

than we could put into it. We had four or five teams, three men to cut corn in the field, six or eight men to stand round and boss and several more to do the work, aggregating in all four teams, thirteen men, and three hired girls working in the house to get ready for us all at meal times. The best we did in any day was to cut twenty-five two-horse loads of green fodder. Last year with a crew of seven men—I was the seventh—we took standing in the field (for I don't believe in cutting corn over five minutes before it goes on the wagon) fifty two-horse loads a day. Every man now has his place and does his own work. There is now one boss in the crowd, and that is myself. I have got through having them tell me how to do it. I want it done my way now. The result is, instead of it costing more than a dollar a ton to put the fodder into the silo, we get it there for an average of thirty cents a load. I have not figured $1.50 for myself, nor have I allowed anything for the board of the men. I am speaking of the actual cash outlay. We have dispensed with all machinery in the field. We have tried most everything, but we have never found anything so good as a good man with a good corn knife. We pick the best corn cutter and pay him two men's wages. His job is too keep ahead of the wagons, and we have never caught him yet. He gets up earlier than any of the others, and gets a start and keeps ahead all day. We have had wagons of all kinds, low hung wagons, and high hung wagons, and every last man of us, so far as I know, has gone back to the ordinary hay rack floored over. Another thing we have dispensed with is having the power cutter up on a platform, so that you have to climb stairs to the table. We set our cutting box below the wagon so that the latter will be eighteen inches higher than the table of the cutting box. Then we have an extension table twelve feet long and two and a half feet higher at one end than the other. The load comes up and is driven close up to the extension table. There is a great deal in the way the load is put on. Everybody has had his plan, but we insist now that our men shall all load one way. It is most convenient to have the tops at the right hand side commencing at the forward end of the rack. One lot is dropped on the extension table and is drawn down the incline to the cutter. One bundle follows another so that there is no delay. My wife held a watch on us once and we got through as large a load as we could get on a fifteen foot hay-rack, putting it through a Ross 14 A cutter in seven minutes. You get rid of two men cutting, and three men helping to load. We load now with two men, instead of five. We have dropped out two teams. We have dropped out the man who stood beside the cutter to help the man to feed, and the man in the silo has disappeared. You have the man who cuts the corn, two men to load, the man who feeds the machine and the engineer "of whom I am one of which." How do you get along without the man in the silo? Stop and think. Which is the heaviest you or the next load of ensilage that comes in. I only weigh 142 pounds. The next load of ensilage coming along weighs 2,500 pounds. I have got to travel round pretty lively to spread my weight out into 2,500 pounds in five minutes. But if you pile the ensilage up in the middle of the pit, you have got to have a man. Take some boards, and make a little table three feet and a half square, and lay it across two poles over the silo right under the top end of the carrier. As the ensilage falls on the table it will form a cone 4½ feet high, and as the rest follows, it is thrown by this slant clear out to the walls of the silo. By and by you will find the corners not filling up very well. Turn your table quarter way round and the corners will fill. Once in a while you have to get in there and do ten minutes' tramping and spreading in the pit, for the ensilage will have to be straightened up a little. You only need to walk once around the outside. When you get within two loads of the end of the day's work remove the table and let the two loads fall into the centre and fill the whole up level. You have the pressure there that will save you two men at $1.25 a day. For two years past we have "covered our silo with 20 pails of water" and in that we struck our ideal cover for a silo. After the last load is in gather up the litter; it is valuable for a cover. Spread it over as nicely as you can and tramp it down a little. Throw an extra forkful down into the corners and tramp it down close. All you have to do in making a cover is to get something that will keep out the air. After two days tramp it down again. This is where your number eleven boots play an important part. Then for a silo fifteen feet square throw on twenty pails of water. Then get down off there and put your trust in Providence. My loss on a fifteen foot silo is exactly fifteen bushels. You may be afraid that rats will get round

Rats are the worst nuisance I ever saw I will tell you what we did with the last one we caught in our place. We caught him in a Champion Liar wire trap. We put him in a barrel. Then we got some gas tar and poured it on him. Turned him loose to tell all the others about what poor paint the Standard Oil Co. made. We have not been troubled with rats since. Without trenching on what I am to say this evening, I may say that our winter dairy is becoming even more profitable than our summer dairy because of our success with the silo. I am convinced that a man can keep his cows cheaper in the winter than in the summer. I figure it out this way: we can raise eighteen tons of good ensilage to the acre. It costs $8 for the labor of raising an acre of corn and $4 to put it into the silo. Each acre will keep two and a half cows seven months, or $12 for the roughage for 2½ cattle outside of the cost of the land. Let us say that interest on land and the taxes are $2.70 an acre, a total of $15 for the roughage for 2½ cows for seven months. If that is not cheaper than pasturing on grass, my mathematics are at fault. A cow eats more with her feet than she does with her mouth in our summer pastures. Our rations for our winter milkers is 50 pounds of ensilage a day, 5 pounds of wheaten shorts and 5 pounds of mixed hay. We have not succeeded in getting cows to eat much more than that. What does this cost us? 50 pounds of ensilage will cost a little less than three cents. You may say I figure at cost. How else are you going to figure? What is the market price of ensilage? If there is no market, I have no right to charge it to my cattle at more than cost of production. Five pounds of wheat and shorts costs me four cents. But I must qualify that. We raise oats and swap them for the mill feed. Why? Because I find that with ensilage a hundred pounds of wheat shorts is worth as much to me as a hundred pounds of oats and a hundred pounds of oats will buy a hundred and fifty pounds of mill feed, and so I have one half more fertility to go back on the land. Five pounds of clover hay costs with us two cents. Call it 8½ or even 9 cents in round numbers for the ration of each cow. What are these cows doing on this ration? All the cows that we had milking last Monday had been in milk since last September or October. The average yield for the whole dairy was 28 pounds of milk per head per day. I sell that milk for $1.40 net per 100 lb. at the door. That comes very close to 40 cents each for the cows as against a daily cost for feed of 8½ cents. Then there is the fertility that goes back to he farm. I get all mixed up when I come to charging for crop and then for fertility which is used to raise another crop. But the fertility is there, let it be worth more or less. That is my experience with the silo, and I thank you for your kind attention.

A MEMBER: How does the pressure of the silage affect the silo?

Mr. GOULD: I am in great doubt about that pressure being as "enormous" as I used to think. My neighbor had the misfortune to lose his barn by fire. Of course his silo was burnt too and when the fire was over there stood the ensilage like Bunker Hill monument. The neighbors put a cover on it and built a silo round it and the owner had his ensilage for use nearly as good as ever.

A MEMBER: But there is pressure at the first and this must be counteracted.

Mr. GOULD: Put up studding 2x8 inches, 10 inches apart, or 18 inches from centre to centre Bridge these just as you do the joists of a building. I have not noticed any indications of giving way in our silos.

A MEMBER: I would like to remind Mr. Gould that our climate is different from the climate he has been accustomed to. We cannot raise corn to perfection as he can in his country. Our country is better adapted for raising roots, and I hold that our cattle cannot live on ensilage. We have to feed them some solid substance. The silo is not a success in this northern region. We can raise mangels and turnips to feed our cattle and keep them in better condition at a cheaper rate than we could by means of corn grown in this northern climate. I do not wish to enter into a long argument on the subject, but the farmers who are present will understand the reasonableness of what I say.

[To this there was much dissent among those present, a score of men or more having silos, and feeding silage with great satisfaction.]

Mr. GOULD: I once put a crop into the silo so that when it was settled I should know exactly how many cubic feet I had. A cubic foot represents about 50 pounds of ensilage. I calculated that I had 1,350 bushels. I think that a bushel of ensilage has the feeding value of two bushels of roots. All the experimental stations in the States and Canada, I believe, endorse that. Whether I can raise eighteen hundred bushels of corn as cheap as I can raise 3,600 bushels of roots is a question for the people in Canada to settle. I have great respect for my friend's roots, but they contain 90 per cent of water, and corn ensilage contains only about 62½ per cent. So you can see which carries the most water to the barn—the most coals to Newcastle.

A MEMBER: We have been growing a good deal of roots to keep our cows for winter dairying. I know it costs this gentleman as much to grow roots as it costs us. I know it is not possible to feed them at a cost of less than fifteen or sixteen cents a day. I would like to know for information, must the filling of the silo be pushed right through or can we do it with our four horse-power cutting box?

Mr. GOULD: It is not necessary to do it all at once. I was once three weeks filling the silos.

A MEMBER: Do you put the water on at once?

Mr. GOULD: The third day after filling I put the water over it and tread it down thoroughly. I want to say that this gentleman misapprehended me if he understood me to tell you to plant Virginia corn. That is what we use over in Ohio. But you must plant the corn here that will suit you best. It is not long since I was in a town in Maine, in latitude 45 miles north of Quebec, and there I found a friend of mine growing the Virginia corn fairly well for his silo.

Mr. HUNTER: I am surprised to hear a man talking about roots in comparison with ensilage. For my part I have abandoned root growing. Within ten miles of me there are half a dozen men who have done as I am doing. We can grow corn more easily, more perfectly, and more surely than we can grow roots. While many still continue to grow roots, I think the best men agree that corn can be grown so as to furnish more feed at a less cost.

A MEMBER: In the south they cannot grow turnips and mangels to perfection. When I was in Virginia there was not frost enough to mature these roots.

Mr. GOULD: But I don't live in Virginia. A gentleman here has asked me whether ensilage has equal feeding value for other animals than milch cows. I think it has. Mr. Clarke, my Ohio neighbor, is a large feeder of steers. He says he can grow steers and fatten them on silage and he cannot do it on dry feed. Mr. Woodward of New York, the largest hot-house lamb grower in the United States, uses ensilage for feeding the mothers of these winter lambs. I came across an experience the other day quite novel to me. "Jim" Brundage, of Berlin Heights, Ohio, feeds his colts on ensilage and straw and a fresher, fatter lot of colts I have never seen. Mark Dunham, of Illinois, is a large feeder of ensilage to horses and brood mares. One time at a meeting of an institute in Ohio, Mr. Bonham, Secretary of the State Board of Agriculture, when asked how extensively ensilage could be used, said that every creature on the farm ate it greedily except the hired girl, and why in thunder she didn't like it, he couldn't tell.

REPORT OF NOMINATING COMMITTEE.

The report of the Nominating Committee was then presented. For list of officers, etc., see page 52.

COMPOSITE MILK TESTING.

Prof. DEAN was then called upon. He said: The composite milk test would not be necessary were it not for the fact that we are paying for milk according to the proportion of fat it contains. I should like to bring before you very briefly some of the arguments for this method of paying for milk in cheese-making. I know this is an old subject, but to a few it may be new, and for the benefit of these few I would like to set forth these arguments. Everyone admits that paying for milk according to the fat it contains is right in butter-making, because butter consists of from eighty to eighty-five per cent. of butter fat. But in cheese it is somewhat different. In round numbers cheese consists of one-third casein or curd, and only one-third butter fat, instead of from eighty to eighty-five per cent. butter fat, as in the case of butter. Before you can convince any man of the justice of this method of paying for milk in cheese-making you must show him that the quantity of cheese produced is about in proportion to the butter fat in the milk, as in the case of butter Some will admit that, but some will not. What arguments may be used in favor of this method of payment? First, the fat is the most valuable element of the milk. At present we are paying the farmers in the neighborhood of Guelph $1.40 per 100 pounds for good whole milk delivered at the dairy. We sell them back all the skim-milk they want for 15 cents per 100 pounds. What we take out is the butter fat, and the difference between the price we pay and the price we get will give you an idea of the value we set upon the fat. We test our cows every day, night and morning, and we find not only that the quality of milk from different cows differs, but there is actually a variation in the milk furnished by the same cow—it varies from day to day, from week to week, from night to morning. Why that should be so I cannot tell you. I know some things that will account for it, but I cannot explain all. So, I say to the farmers who have found the test of their milk varying, that if the maker is careful you need not wonder at the quality of milk varying, for variation will occur under the very best conditions. We have cows in our herd that averaged about 2.85 of fat One cow averaged 2 95, while another in the same stable, with the same feed, under the same management and with the same conditions, so far as it was possible to make them the same, made an average of 5.50 per cent. Why is that? The individuality of the animal. It is not possible, in my judgment, to feed the three per cent. cow so as to cause her to improve the quality of her milk to five per cent. Why? Because she is not built that way. Every cow, like every man and every woman, has her individuality. Another cause of variation is the breed. We have five different breeds of cows in connection with our dairying department, and the percentage of fat differs with the different breeds. We have found that the frequency of milking affects the percentage of fat in the milk. The oftener you milk the cows the richer will be the milk. Now I don't want you to think so much of that point that you will go off home and begin milking your cows every half-hour. In 1892 I took two cows and had them milked three times a day to see what effect this would have on the percentage of fat. We milked at five o'clock in ths morning, eleven o'clock in the forenoon and five o'clock in the evening. We found the forenoon and evening milk much richer than the morning milk. That would naturally be the case, because there is a longer interval before the morning milking than before the others. During this winter we milked some cows every hour. What you get in that case is simply strippings. Why not milk every hour then? In some cases it may pay, but under ordinary conditions it will not pay to milk a cow oftener than twice a day. Then we find that the period of lactation has much to do with the quality of the milk. The longer the cow has been milked the richer will be the milk. Another difference is between the night's and morning's milk. Another difference is made by the condition and comfort of the cow. If the cow is exposed to cold or storm, or hurt, you see the effect immediately in the changed quality of the milk. Let me give you an illustration. One of our cows ran across a stick, injuring a portion of her udder. She had been giving about 3.75 per cent.; she immediately fell off to about 2½ per cent., and so remained until the injured part was healed. Then we come to the oft repeated question, which I will only mention: Does the feeding affect the quality of the milk? I may say, judging from our own experiments for the last three years, that feeding has very little to do with the

percentage of fat in the milk. Another reason for paying for milk according to the butter fat is that the casein, which forms one-third of the cheese, increases proportionately with the increase of fat I shall not go into that question at length, but shall leave it to Prof. Van Slyke. Another argument is that the higher per cent. of fat the less milk it takes to make a pound of cheese. That is not absolutely true, but I will leave Prof. Van Slyke to explain that also. Another argument is that paying according to the butter fat test will lead to an improvement in the quality of the milk, and thus will benefit all concerned. The last argument is that, paying by this test patrons are not likely to be accused wrongfully of tampering with their milk. If the new system did nothing more than this it would be well worth all the trouble and expense. If a man is once accused of skimming or watering his milk that accusation stands as an everlasting disgrace upon him and his family. To avoid any chance of accusing an innocent man wrongfully would be worth all the trouble and expense of the new method. These remarks I make by way of introduction to the consideration of my subject, the composite milk test. This was first brought before the public by Prof. Patrick of the Iowa Experimental Station, in Bulletin No. 9. He worked with a number of preservative substances, but found mercuric chloride of corrosive sublimate the best. He said that the one to be used should have the three following qualities: (1) It must hold the fat of the milk unchanged for the length of time desired. That is necessary in order to be able to hold the samples of milk for a week or longer. (2) It must keep the sample in good mechanical condition. What do we mean by that? It must prevent it from souring, becoming thick, or allowing the cream to get into such condition that it will not mix with the milk. (3) It must not interfere with the working of the test. Now as to the methods of working the composite test. There are four or five points I wish to speak on. One composite test that has been used and recommended is a pipette holding one-sixth of the amount required for the Babcock test. As you know, the amount required for the Babcock test is 17.6 cubic centimeters. A centimeter is a unit of measure in chemistry, just as we speak of a quart or a gallon. Taking one-sixth of the quantity each day, we shall have in six days the quantity required for the Babcock test. Another way is to take one-third of the amount required for the test, or 5.9 centimeters. In that case you test twice a week. To see whether these are accurate or not we did some experimental work. I would direct your attention to the figures on the chart. In this case, where we made the test every day, the average is 3.073. Where we used the 5.9 centimeters pipette and tested twice a week the average was 3.072, practically the same. And where we used the smaller pipette the average showed but a slight difference, being 3.045. The 5.9 pipette test was close enough for all practical work. In the case of the smaller pipette, the quantity of milk taken is so small that I would not recommend the use of this method in practical work, as it introduces an element of possible error. Another way recommended by Dr. Babcock is to have a double-sized bottle, and, instead of putting in 17.6 centimeters, put in 35 centimeters and then divide the reading by 2. I have never tried that method, and I do not know how it would work. Another method which we might call a souring method is that brought before the public by Prof. Farringdon, of the Illinois Experimental Station. He recommended taking a sample every day and putting it in a jar and allowing it to sour. When milk sours the sugar is turned into an acid which coagulates the casein or curdles the milk. If an alkali is put into this milk the milk will return to its liquid condition. For this purpose he recommended potash or concentrated lye, and those who have tried it have found very good results. There is more work about this method than the next I shall explain, which is known as the potassium bi-chromate method. This substance is perhaps not new to all of you. I have a sample here. I think we pay fourteen cents a pounds for it, so you see it is not expensive. This method has been patented in Sweden by Mr. J. A. Alen. This is a yellow substance, as you see, and it is very cheap. After it has been added to the milk it turns the milk its own color. One great objection to the use of the mercury chloride as a preservative is that while it will keep the milk sweet, it is not only a deadly poison, but it does not reveal its presence. Those who use this method add some coloring matter. Prof. Patrick recommended aniline red. The bi-chromate colors the milk of itself, and so removes this cause of danger. To test

this method and to find out whether we could not keep samples we made some experiments. I took four jars to hold the samples of milk, and every time we put a sample into the jars we took another sample and tested it at once with the Babcock test, keeping a record of the percentages shown. The object of taking four jars was to make provision, so that in case of accident we should still have two or three jars to use in the composite test. The result of the two plans of testing, the daily test with the Babcock machine and the composite test of the milk in the jars is given in the chart.

COMPOSITE TESTS WITH BI-CHROMATE OF POTASH.

—	One-third and one-sixth pipettes compared with daily pipettes.		
	Average of daily tests.	Average 5.9 c.c. pipette.	Average 2.95 c.c. pipette.
Average 21 trials.....	3.073	3.072	3.045

Date, week ending.	Jar No. 1.	Jar No. 2.	Jar No. 3.	Jar No. 4.	Average of fat in 4 Jars.	Average of daily tests.
1st trial.						
August 12.....	3.20	3.20	3.20	3.20	3.20	3.16 for 1 week.
" 19.....	3.05	3.00	3.00	3.05	3.02	3.20 " 2 weeks.
" 26.....	2.60	2.70	2.60	2.65	2.64	2.79 " 3 "
September 2.....	2.70	2.60	2.70	2.60	2.65	2.78 " 4 "
" 9.....	.....	2.50	2.50	2.50	2.50	2.63 " 5 "
" 16.....	.....	2.55	2.30	2.30	2.45	2.57 " 6 "
" 23.....	.....	2.60	2.60	2.60	2.60	2.68 " 7 "
2nd trial.						
September 30.....	2.20	2.30	2.20	2.20	2.22	2.20 for 1 week.
October 8.....	2.60	2.60	2.55	2.55	2.57	2.57 " 2 weeks.
" 15.....	2.60	2.60	2.55	2.60	2.59	2.51 " 3 "
" 22.....	2.80	2.75	2.80	2.80	2.79	2.65 " 4 "
" 29.....	2.90	2.90	2.90	2.85	2.89	2.77 " 5 "
November 5.....	2.45	2.50	2.50	2.45	2.48	2.53 " 6 "
" 12.....	2.75	2.75	2.75	2.75	2.75	2.73 " 7 "

The conclusion I would come to is that we can keep samples of milk for at least a month and be able to test them at the end of that time with accurate results. I wish to throw out a few hints for the use of those who decide to follow this method. First, put enough of the bi-chromate into the jar, about as much as will lie on a ten cent. piece, before the milk is put in, then in ten days add a little more. If the samples begin to sour put in still more. Shake the samples when the milk is added, just enough to loosen the cream. Put in a measured quantity every day. About a fluid ounce we found to be good for all practical purposes. In case the sample becomes sour you may test and record the test at once Commence the test again. Have the samples warm in making the test. One trouble with the Babcock test comes in here. The samples are not kept warm. We did not get good results otherwise. There is another point which I was glad to hear Prof. Van Slyke mention. Some makers are afraid to put a little elbow grease on the crank of the machine. You can't make it go too fast so long as the bottles do not break. If the whirling is not fast enough the separation will not be complete. The sample bottles for the composite test should be thoroughly cleaned every time. What are the advantages of the monthly test? First, it saves three-quarters of the labor of the weekly test, as well as three-quarters of the wear and tear on the machine and the risk of breaking bottles, and so on. Then it saves three-quarters of the work now required o

the secretary, an important item, indeed, for instead of multiplying the per cent. of fat by the quantity of milk each week, he would multiply only once a month.

I would recommend the trial of monthly composite tests with a few fractions at first, and then if it works satisfactorily it may be used with all. Do not rush into this at once. Though we obtained satisfactory results in the dairy, in a factory it may be more difficult.

SECOND DAY—AFTERNOON SESSION.

On resuming in the afternoon, the first speaker was Mr. D. M. Macpherson, Lancaster, who was announced to speak on

MY EXPERIENCE AND PRACTICAL RESULTS OF FARMING 120 ACRES OF LAND FOR PAST FOUR YEARS.

Mr. Macpherson said: I feel diffident in addressing so large and intelligent an audience evidently desirous of further information to assist them in their work. I crave your indulgence while I present a few thoughts and experiences covering four years directly and indirectly a much longer time. We have come here to-day to receive practical information. It appears to me that in dairymen's meetings, farmers institutes and other similar gatherings there seems to be too much advice and not enough of practical example. My experience with the farmer leads me to believe that the medium through which he takes most of his information for practical purposes is the eye, and with him the sense of sight is more highly developed than any other sense. The farmer's avocation largely consists in carrying into practice what his eyes teach him, and in his work he is guided mainly by his eyes. In plowing a field, building a fence, in construction work of all kinds the eye is continually practised. He is not called upon so constantly to cultivate his reasoning powers, and it is therefore not so easy for him to receive information through that part of the brain which is not so cultivated. With the farmer it is particularly true that seeing is believing. Demonstrate a thing by an object lesson and he can understand it, demonstrate it by theory and it remains as clear as mud to him. I came here to give, as nearly as I can, an object lesson of my experience for four years in farming 120 acres. I have found that farming, as a rule, does not pay. The experience of the great mass of farmers in this country is that, when their debts are paid, they have very little in their pockets at the end of the year. This is a serious matter, and if the professors from our colleges come forward and tell us that there are methods by which farming can be made to pay, and do not prove it from practical experience, how are our farmers to believe them? I believe that in the future practical demonstration will be made of the best methods of farming in every county in this noble country of ours. With this demonstration the small farmer in the vicinity will see that practical methods based on experience and guided by business principles will enable himself to succeed. These are the three great points in farming—practical methods, based on experience and guided by business principles. Having this in view, some few years ago I undertook in my own humble way to find if it was not possible to work an ordinary poor farm that had been run down in such a way as to make it pay. The farm I have contains 120 acres under cultivation. The soil is a light loam on the surface with a sandy bottom—what we should call a very light soil. It had been cropped for fifty or sixty years, grain being sold off it very largely, but a fair number of cattle kept on it. Four years ago the land was run out and there was no profit in working it. It was rented for a few years, and the man who rented it went away poorer than when he took it first, though he paid a very small rent indeed. I began by employing men to do the work, paying them by the day. I was several hundred dollars in debt at the end of the year. That was the experience previous to the four years. I determined upon a change and made my plans with a view to procuring the best results with the least labor. The first change was to reconstruct the buildings, putting up spacious stables and silos. The object was to produce milk, beef and pork. The building had room for 140 cattle, 900

tons of ensilage, 50 pigs, the grain of 1,500 bushels threshed and 25 tons of straw. I have been feeding that number of cattle for four years. I will hurry on and give a synopsis of the work done and then draw the conclusions and point out the lessons which my experience seems to warrant. The crops of the past year has been 800 tons of corn, 80 tons of hay, 70 milch cows, 10 dry cattle and 30 pigs. The feeding this year is 50 milch cows and 90 fattening cattle young and old, quite a number of them young. The saleable products for the year up to the first of May, were milk $2,300, pork $350, fowls $350, increase of fat cattle $1,800, total $4,800, the year's crop. What feed was required that was not produced on the farm? The purchased feed was 20 tons of cotton seed meal, 80 tons bran, 15 tons linseed meal, 30 tons straw, total $2,000. But the manure value of these oily foods and bran is quite an item. I believe it will amount to 50 cents for every dollar of purchased feed. This estimate is reached by careful calculation based on the figures of Johnson, Laws, of England, and other prominent men, and I believe it is correct. The value of this material is in what is saved. If half its valuable elements are allowed to run off in the ditches, or still worse, to be drained into the well to be pumped back for the use of the cattle, spreading disease and death among them, or still worse among the family, the saving is turned into a loss. The estimate I have given presupposes the saving of the material and the use of it to the best advantage. I shall refer to that latter on. The cost of labor was $1,200, expenses, wear and tear, repairs of machinery, etc., $200. This leaves a profit of $1,200. Every day's work is accounted as paid for in hard cash out of the returns of the farm. What does this profit of $1,200 mean. It means that those working on the farm made $2 for every $1 paid to them. That is a point that should be seriously considered by every farmer in this land. How much does the farmer receive for every day's work he does on the farm? If he pays a dollar a day to a man, how much does that man produce as a profit? Taking the average farmer of the average district, his receipts for his day's work do not amount to $1 a day. How can the profits be increased is the great question for the farmers to consider. Now, the large amount of fertilising matter returned to the soil has a two-fold benefit. One is that it helps to increase the profits year by year, and the other is that it increases the selling value of the farm. Thus measuring the profits only we have only half of this part of the calculation. Our large corporations, banks, railways and so on are keen to perceive business tact and ability in a man, and they secure those who possess this quality. Why? Because the work of such men increases the dividends of the company and every one per cent. added to the yearly dividend means ten per cent. added to the market value of the stock of the company. The same law applies to farming as to every business undertaking. Increase the profits of your farm, and you increase the value of the farm. Let me point out some of the lessons these results have demonstrated:

1. Farming can be made to pay. Some who are called the best young men of our country—brilliant, talented men, with strong ambitions—looking into the future see no prospect for them on the farm and they leave us for a foreign land, and there, very often, they make their mark. But if there was a prospect of a good return for labor employed on the farm, these young men would remain on the farm and would assist in the development of our country as a whole. Farming can be made to pay even with hired help. In fact the farmers of our country are working too hard—that is they work too much with their hands and not enough with their brains. Competition to-day has its best rewards for brain-work, not for hand-work. In the days when the forest had to be felled the strong man was the great man. But to-day the great man is the man of intellect, the man who understands nature's laws and can so apply those laws as to benefit himself and those about him and the country at large.

2. Land can be made to increase in value by increase of its products and its fertility. After what I have said this calls but for a passing remark.

3. Profits are greatest when working to a plan. This is an important matter. Where is the farmer to-day who plans out his work from one end of the year to the other? What would you think of an architect or of a man building a house who would cut his timber or lay his foundation without devising a proper plan of construction? That man

is most successful in building who studies out in detail all the requirements and the means by which they are to be met. Close planning and calculation are necessary in every business, farming being no exception. What is the best plan? That is the best plan which will give the largest profit year by year, while also increasing the value of the farm. This year I had the curiosity to make special enquiries among farmers I met to find out how many of them worked to a plan in fall plowing. And I did not find one who started out with a definite plan. Most of them said that if we had fine weather they would plow until frost came. A man should know how many acres he is to plow in the fall—how many acres for this crop and how many acres for that.

4. The fertility of land is increased to the greatest extent by buying animal foods. I have tried buying commercial fertilisers and city manure and all things of that sort, but none of them give the same results as stable manure. I can tell you here I would not draw city manure more than two miles if I could get it for nothing. By feeding cattle you can stock your farm with fertility just as the merchant stocks his store. And to my mind, there is no better comparison. What would you think of the merchant who, starting with a full stock would sell to his customers, spend the money he received for his own living and never buy anything to replenish his stock? There could be only one end for such a man—bankruptcy. Some farmers go on selling wheat and butter and beef but returning very little to the land. The result is that the fields furthest from the barn begin to grow poor until, as in the case of some farmers I know, the only fertile piece of land they have is the garden.

5. Commercial fertilisers pay only in special cases. If you want to force a crop or if you have not sufficient barn-yard manure then buy a small quantity of commercial fertiliser of the best analysis and quality. For one raising turnips I believe a small quantity of phosphates will be found profitable, and in corn a small quantity of superphosphates to overcome the drawbacks of the season.

6. It pays to buy feed to make manure. The farmer is a manufacturer in the full sense of the term. Every product of the farm contains the same elements. The animals he feeds are made up of the same elements as the grass upon which they graze, and the milk and butter and cheese contain the same elements as the animal. All manures or fertilizers or plant food as they should be called, contain the same elements as grass, as beef, as milk. If you can take a dollar's worth of a cheap material such as bran and turn it into $8 worth of milk (bran is the most highly concentrated food for milk production that we have) you are a manufacturer just as though you had converted a dollar's worth of iron into $8 worth of iron castings. These are the processes we must consider as farmers, as manufacturers, as business men. We must take cheap material, and by labor and observance of the laws of nature convert it into a more valuable form with the greatest profit for the capital used and the labor employed. The business phase of farming is the great question that must be considered by the farmers of this country. The farmers have enough practical experience, they need not be taught the practical work of farming. Many know the science of their profession. But I have yet to find a practical man having scientific knowledge, having the business ability, to use these two so as to produce the most profitable results. Successful farming consists in so adapting means to ends as to make every dollar paid for labor produce two dollars, and the best mediums for this are stables and the silo. I did not hear Mr. Gould, unfortunately for me, but I have no doubt that in giving you the results of his four years' experience he impressed you with the importance of the silo. The next important point is the stable. The stable should not be, as so many of our stables are, a place where the health and strength of the animals are reduced, where tuberculosis saps the life of the animal and where the fertility that should go to the land is wasted. Every stable should be a fertilizer factory producing the greatest quantity and preserving its quality to the greatest extent. Every dollar's worth of fertility lost is $5 lost from the saleable products of the farm. Every dollar's worth of fertility lost means the loss of another dollar in interest and in labor, which would be needless if the land had been made fertile. These suggestions I believe to be of great importance to our farmers and of vital interest to our country. In the year just closed we have won pre-eminence in our success at the World's

Fair. We have been striving to make our cows yield more to increase their product from 2,500 pounds per year up to 3,000 or 4,000. But let me say that at the same time we have been allowing our pasture to go down from 1,500 pounds to 1,000 pounds. I believe that the net result has been to increase the cost of producing a pound of milk. If we can increase the product from 1,000 pounds per acre, which is rather more than the average, to 3,000 or 4,000, we increase the profits at least six times. Take an illustration. Suppose the price of milk to be 80 cents per hundred pounds, a fair price for this season. The cost of producing 1,000 pounds of milk, converting it into cheese and selling it is $6. That leaves only $2 profit per thousand pounds. Suppose the product per acre is increased to 4,000, which is the extreme. At 80 cents per hundred you have a revenue of $32. The cost of production, manufacture and sale is $12, leaving a product of $20, or ten times as much as in the former case. At the same time we should increase the value of our farms, so that the profit would grow in both ways to an extent our farmers have little conception of. The only way to bring about a general improvement is to do as I suggested at the outset—in each country if not in each county, take a farm that everyone knows to have been run out and have some able man demonstrate how that farm can be made to pay while enhancing its value year by year. This can only be done by the joint action of the two Governments—Federal and Provincial. I am not going to make a political speech, but I want to show the bearings of government in our country. The Federal Government has control of the taxes. It can increase or reduce the expenses of every man and thus it controls his out-go The Provincial Government has control over education and thus it has great control over the resources or income. The Provincial Government is spending large sums in assisting dairymen's associations, farmers' institutes, agricultural societies, the Agriculture and Arts Association and other similar institutions. Then we find that the Federal Government is spending large sums on experimental farms which are located at a few points and necessarily are distant from the vast majority of the farms of the country. Moreover the gulf between the experimental farms and the ordinary farm is too wide to be bridged ; the ordinary farmer cannot follow their methods. There is too much land in our experimental farms and agricultural schools. It frightens the ordinary farmer to go through one of these places and see the extent of its land and the elaborate character of its outfit. The true remedy is for the Governments to join forces to make practical demonstration of good farming in every township. These experimental farms would be direct object lessons to the farmers of what could be done on their own farms. Let me give you an illustration. Three years ago a farmer in my neighborhood was involved to the extent of about $1,000 on a fifty-acre farm. He had a miserably poor farm and he had only two years to run when he would be put out on the road. He asked me for assistance. He was a rather hard specimen to do anything with, for he was a poor farmer with a poor farm and everything about him was in miserable condition. I told him I thought I could save him. I advanced him $1,000, built him a silo for 200 tons and planned him a stable for 32 head of cattle. He has paid me all but $180 and has paid interest on the original mortgage besides, and I give him three years more to be free of debt. When he came to me his head was down, he expected his young family to be thrown out on the road ; he was discouraged. To-day he is up early and late whistling about his work, and I can hardly hold him back from buying his neighbor's farm. What did I do for him ? Merely assisted and advised him. His experience has been one of the best object lessons I ever had. In the same way the working of these farms in the various townships would be an object lesson to the farmers—they would teach the farmers through the eye, the organ through which he can best be instructed. I have talked longer than I had intended. I hope you will consider the importance of my subject as some excuse for the extended character of my remarks

A MEMBER : How do you preserve stable manure and when do you apply it ?

MR. MACPHERSON : I use large quantities of absorbents. I find that the best is straw. If you can't get straw it is best to have tanks into which the surplus is drained. I have tanks for the surplus liquid. I put the manure out in the winter on the fields and in the fall on the pastures. My pastures are the best land on the farm, too good for anything else, for that is where the money is.

A MEMBER: Do you keep permanent pasture?

Mr. MACPHERSON: No, but I forgot to give you the rotation. As I said I work to a plan. I grow 40 acres of corn, 20 acres of grain, 20 acres of hay and 40 acres pasture. I find milk to be the best paying business, so I give the best and the most land to its production. The least paying business is grain.

A MEMBER: What do you seed down with?

Mr. MACPHERSON: I seed very heavily—nearly a bushel of seed to the acre, with such a mixture as two classes of clover—red and alsike, timothy and red top.

A MEMBER: Do you have any difficulty in securing proper help to attend to the stock?

Mr. MACPHERSON: None at all—working to a plan. The cattle are fed a balanced ration which is laid out, and the men cannot make any mistake.

Mr. J. A. JAMES moved that the report of the Nominating Committee be received and adopted. Mr. RODEN seconded the motion. Carried.

THE PRESIDENT'S ADDRESS.

Mr. GEARY, the retiring President, said: This finishes my term as President. In this position I have had two years of real pleasure. Your directors have worked most harmoniously, and I think their work has been in the interest of the dairymen of this country. We started last winter some new work which, I think, is now bearing its fruit. We held local conventions in different sections, and, I think, one result of those conventions is shown in the splendid attendance here to-day. I congratulate you on the way you have turned out to promote the interests of your own Association, because I have always held that this Dairymen's Association of Western Ontario is an association of the people, and in some previous years I have been sorry to see they were not taking the interest in the Association which their own true welfare demanded. I am glad also to see the discussion which is taking place and to find so many questions asked. I have always looked upon that as the most interesting part of the proceedings. I thank you for the kindness you have shown me. I have been treated by the dairymen with the greatest kindness during my term of office. I retire feeling that my successor is one in whom the dairymen have confidence, a man of energy, a man of ability and one who has the interests of the dairymen at heart. You will find him a live president. I have much pleasure in introducing him to you.

Mr. PATTULLO, in taking the chair, said: If I do not thank you in fitting terms for the honor you have done me, it is not because I do not appreciate your kindness. I am a comparatively young man and a comparatively young member of the Dairy Association, and I should not for a moment have entertained the idea of accepting this position over the heads of men in the Association who deserve it more than I do on the ground of experience and of service to the dairy interest, had it not come to me spontaneously and, as I believe, with their good wishes. I assure you there are few positions in this country to which a young man may honestly and honorably aspire I would deem it a greater honor to occupy. I do not forget that this position has been occupied by a long line of able and prominent men, men who not in relation to the dairy industry only but also in relation to the public affairs of the country, have made honorable records for themselves. When I reflect upon the fact that such honorable and able men as our friend, Mr. Ballantyne, and others almost equally prominent have occupied this position, it is only with great diffidence that I accept its responsibilities. It would not become me to take this place without referring to the eminent services rendered to the Association and to the dairy interest by our retiring president. Were he not present I could speak more fully on this subject than I can in his hearing. The more worthy the man the less he cares to hear anything like flattery. But it is no flattery to say that Mr. Geary,

as President, has worked ably and well, that he has put new life into the Association, and that his tenure of office has resulted vastly to the benefit of the dairymen of this western district. There are many things one might be tempted to say in such circumstances as the present, but I must not interrupt the discussion of the practical questions you have assembled to consider. All I can say is that, inspired by the past achievements and the present position of the Association, and by the recollection of this splendid audience, I shall leave nothing undone to promote the interests of the Western Dairymen's Association and of the great dairy industry of this country.

Mr. J. W. Scott: I move that a vote of thanks be tendered to the retiring president, Mr. Geary, for the efficient manner in which he has discharged the duties of his office. He has proven himself to be one of the very best presidents we ever had. He has shown great ability and has worked in our interest, not only through the Association but in every way possible.

Mr. J. A. James seconded the resolution. The resolution was carried unanimously.

Mr. Geary: I thank you very sincerely for this expression of your kindly feeling toward me.

The President: I have now great pleasure in introducing one who needs no introduction in a meeting of dairymen in this country or elsewhere in America, Prof. Robertson, the Dominion Dairy Commissioner. It was a matter of keen regret to us all that he was unable to be present at the Convention in London last year. We are all more than delighted to have him with us to-day.

SOME THOUGHTS ON WINTER DAIRYING.

Prof. Robertson: I beg to congratulate you upon two things—first, upon the success of this Convention, assembled to talk over past progress, and make plans for future achievements; and, second, upon the fact that your worthy President of last year has been succeeded by one willing and able to do much for the advancement of the interests of dairymen throughout Western Ontario. More is expected of an association which has a long and creditable record than of any new organization, and because the history of this Association is one of which every member may be proud, all the more is expected of it in coming years. I am to speak to you for a short time on the winter dairying movement in Ontario. Because of all that is behind us as a people, we have a country of magnificent possibilities. Because of the trying experience we have had in making this a country of comfortable homes, therefore, we are the better able to meet those problems, which face every man, of making a living for himself and a competence for his family. Agriculture in our country has grown and is growing. The occupation that continues the same to-day as yesterday affords tastes fit for savages and not for civilized men. Years ago men in our land, men—from stress of conditions, men merely disturbed the face of mother earth, put in some seeds, ate the crop and had to be content. In those days muscular strength was the mainstay of agriculture, and the only economy possible was the constant exercise of the most rigorous self-denial. But other conditions have moved us to another plane. When I speak of the winter dairying movement, I make no reflection upon the past of dairying. But we should rise out of the past so that we may enjoy a more profitable present and a better future. Winter dairying as a movement is a thing I am proud of, because of its past and its present and the hope it affords for the future. Nowadays in agriculture the main requirement is mental power. By this I do not mean what is commonly known as information. Sometimes I have thought that in attending meetings in recent years we are embarrassed by the abundance of things we hear, and that we go away laden down, trying to bear away the things the speakers have told us. What we need is not more information but the power to act on the things we already know. That is one reason why I am so proud of my friend, Mr. Macpherson, because he not only shows mental power, but mental power applied in

achieving results. The man who believes that his work will bring results works with power, his spiritual life is regenerated, his mental life quickened, and his bodily life strengthened. Economy is not so much self-denial. Too many men think that to keep is to save. But it is an old philosophy, and one which you and I believe, that to save one's life is to lose it, and to lose it is to save it. Now the largest economy is for a man to spend the whole of his life in his work, not to labor in the field with his hands only, while his mind is occupied with politics or something like that. This is essentially an agricultural country, and most of the wealth we make must be lifted out of the soil by the intelligence of human minds and the skill of human hands. Whatever ministers to human wants or human happiness and of which the ownership can be transferred is wealth, not money alone. Take an instance. A man cannot eat a song nor can he burn a song to keep him warm, but the man who can sing well can exchange that wealth for that which will keep him warm and feed him will. So a song may be wealth. Many farmers have no wealth in their lives by having no happiness in their occupation as such. Winter dairying will give many a man his first taste of that kind of wealth which consists in the knowledge that he is doing a man's work, the ownership of himself and pleasure in his tasks, and that is the best kind of wealth. What is the source of wealth and how will the winter dairying help us to draw from that source? The sun is the source of wealth. Can a plant grow except the sun shines? The strength of the sun is stored in the plant just as part of my strength is transferred to my watch when I wind the spring. That plant being eaten by the cow, the strength of the sun is released and warms the cow. There is comfort for the cow and wealth for the man who owns her. You can provide springs into which the strength of the sun will roll itself to the extent of 700 pounds per acre. You cannot get more than 30 pounds into the cow by means of pasture, but you can get 700 pounds through the sun-flower. There is plenty of wealth in the air which we have never been able to grasp A man cannot gather the air and exchange it. But he can plant clover under suitable conditions and the roots of these plants will draw nitrogen from the atmosphere and this you get ultimately in the form of beef and cheese and thus you in effect grasp and store the atmosphere so that you may sell it by and bye. Besides this original source of wealth, we have to take into account what we call human labor, one of the great factors in the creation of wealth. It is often said that one man is as good as another—the ultra democrats are credited with saying, "yes, and a good deal better." I recently saw a statement that the German Empire could have afforded to pay Von Moltke, commander in chief, ten million marks a year rather than have an inferior general who would board himself and pay for his own uniform—and lose the battles Von Moltke won. Human labor is worth what it can earn. I would like to see men earning $2 a day right on our farms. But we cannot do that by growing grain. Why? Because a change has come in the conditions. The man who lives in New Zealand and who used to be a factor of which no Canadian had to take account, is now next-door neighbor to the man in Canada. Every factory has as its competitor the dairyman in New Zealand who makes butter to send to England. Telegraphs and railways and steamships have actually annihilated space so as to make men who live at the uttermost ends of the earth direct competitors in the same markets The coolie of India, who wears despondency and not much else, and the moujik of Russia are direct competitors of the Canadian farmer, who has to take the same price that they are willing to accept. So long as the laborer in England or elsewhere can buy grain from the poverty-stricken and low-class laborers of these countries, so long will he pay Canadian farmers at the same rate as he pays these others for the work they do. We did not make these conditions; they have come.

How shall we meet them? By devoting our labor to the production of a class of products that the coolie and the moujik cannot send into the world's markets—products that require skill, intelligence, education, brains—products that will command for us the price of high-class labor. That is what winter dairying will do for Ontario. In 1887 wheat, we were told, was lower than for 125 years. And it is lower now than it was then. The same influences have affected the prices of other grains, but not quite so badly. Stern necessity puts the farmer in this position—and he is the only one of all the productive laborers of the country to occupy it—that he must give value for

everything he receives. That is the law of the farmer's life. The man in business buys goods and an upward turn in the market brings him wealth. The farmer must give for what he gets, therefore he must train himself to produce those things for which people will give, and give largely. Wheat is an excellent thing to grow, and so are oats (for oatmeal, you know), but if a man cannot get well paid for these, let him turn his attention to the things for which the world will give a fair equivalent, and those things are animals and their products. We must have better beef, cheese, butter, bacon, pork and mutton. Some of these are the outcome of successful winter dairying. Let me take a few moments to show you what dairying has done for this country in the past. Take, first, the amount of money it has brought in. The figures are such as my mind cannot grasp, yet they suffice for comparison. In the year ending 30th June, 1887 (that is, taking mainly the make of cheese of 1886), Canada sent out cheese to the value of a little over $7,000,000. For the year ending 30th June, 1893, the cheese sent out represented a value of $13,407,000, besides the increased consumption of cheese in our own country. Take the returns for Ontario for the same period. According to the report of the Bureau of Statistics, Ontario in 1886 had a cheese output of $5,893,000, and in 1892 the figure ran up to $8,959,000, an increase of over 50 per cent. Our success in Ontario is linked with that of the other Provinces.

In Quebec the total output in 1886 was $2,265,000 and in 1892 it amounted to $5,647,000, a gain in the same period of about 150 per cent. Down there they had been waiting so long that they could extend rapidly when once the information came as to how it could be done. In 1889 our export of butter for the whole Dominion was $331,000, and last year we exported $1,118,000. So, in less than four years, we gained over 130 per cent. Up to 1889 cheese-making had been displacing butter-making over the whole of this province. Farmers who used to make butter and sell it in the fall were supporting cheese factories, and the butter business was going down. But since that time we have been making splendid progress in both. We should try now to make rapid progress in butter-making and leave the cheese to take care of itself, so far as extension is concerned. In every sense this dairying business in both branches has saved our country from financial depression. It has helped our people to pay their debts, and to get comforts and luxuries. It has done more than that—it has improved our crops and protected our fields. You will find to-day that the most productive and fertile lands are those where cattle have been kept, where dairying has been followed. That brings me to the question: In what direction should our dairying be extended? Mainly, I believe, in the direction of butter-making, and that through the winter. First, the market warns us lest we overdo this cheese business. We send to England now more than half the cheese she buys from outside countries. When you push a competitor against the wall you drive him to devise means to hurt you in return. Now, when we begin to push other countries hard with our cheese, we had better try to find something else in which competition is not so keen. It is not so keen in butter as in cheese. There is no reason why we should fail to sell an equal quantity if we keep up the quality. But all business experience warns our farmers to have two products to depend upon rather than one, and, as they have claims upon them twelve months in the year, to have a revenue for every month in the year. And, better than two products, let them have a multiplicity of products to fortify themselves in these days of uncertain markets; let him have not cheese and butter only but cheese and butter and bacon and beef. I do not know how a man can raise swine and make it pay unless he has skim-milk or buttermilk. The profit is not in merely causing the animal to grow in weight, but in carrying it over when green feed is not to be had. You can carry the swine over on skim-milk. Having considered a few of these general principles, the question faces us: Is winter dairying practicable in our country? Many of you will remember that in 1887 on this platform ex-Gov. Hoard discussed this question of winter dairying. Many said that with our severe winters, our bad roads in spring and fall, our not very well constructed barns, it was a question whether winter dairying was practicable. I was not sure at that time that it was. The theory seemed all right. I went that winter to Wisconsin, and visited factories and attended farmers' institutes. I found winter dairying profitably carried on in a climate like ours. I found the same true of Denmark, and I became an advocate of

winter dairying. In fact I talked so much about it that it became a sort of nickname. But if a man is to accomplish anything it must be by concentrating his efforts. In driving a nail it doesn't pay to hammer the whole face of the board. Being convinced that the idea was a good one it only remained to make a practical test of it to find out whether it could be carried into effect. Three winter dairying stations were established, one at Mount Elgin, one at Woodstock and one at Wellman's Corners. The butter made at these stations last year realized $12,000. The actual amount of money paid to the farmers supplying the three stations averaged 90½ cents per 100 pounds of milk. They had the skim-milk and buttermilk to take home besides. Up to the present time at Mount Elgin, which is right in your neighborhood here, we have been able to pay for the milk up to the end of December an average of $1.03 per 100 pounds of milk, skim-milk and buttermilk to be taken home besides. The net price realized for butter at Woodstock and Mount Elgin was 21 cents. The butter sold for 24½ cents, and the charge for making was 3½ cents. The money comes back to the farmers as soon as the butter is sold. If all the factories in this Province would support butter-making in the winter—not in the same factories necessarily but in central places—you would find a splendid increase in the revenues from dairying. It need have no influence in curtailing the summer dairying. Winter dairying will give paying employment to the farmers during a season otherwise but little occupied. There is nothing that makes a man feel less a man than trying to kill time between the barn and the stables when there is little to do, or sitting around the stove in the way of the womenfolks. Call to see a farmer who has to put in his time in this fashion, and at the very outset he wants to apologize for being seen with so little occupation. But when he feels that he is doing a man's work and earning a man's wages he is more of a man and bears himself accordingly. If he engages in winter dairying he is busy looking after his cattle and finds remunerative occupation for every part of the day. Meet him then and he has no apologies to make, he is independent and feels himself a man. I have mentioned that winter dairying will bring a revenue for every month in the year. That means that it will make a large amount of capital, now practically unused, profitable every month. I cannot give exact figures, but it does not require figures to convince you that the interest paid by the farmers of this country on money borrowed and invested in land or stock is something enormous. To leave that capital idle is to lose money. I have it on the authority of Hon. John Dryden, whose statements can be relied upon, that the amount of capital invested in dairying in Ontario is $175,000,000. Just put 4 per cent. on that money, or 2 per cent. if you like, and think of the loss in leaving so large a proportion of it idle during the winter when it might as well be earning fair interest. Further, winter dairying will give the cheese makers employment during the winter. What will that mean? It will mean that the cheese-makers will make better cheese during the summer. The cheese-maker who knows how to make good butter understands his business better than the one who does not. He will be able to work as cheese-maker for less wages, because he will have employment the year around. You cannot expect to hire a man at the same rate for five months as you do for twelve. You give employment to the cheese buyers who, most of you think, would not be any worse off for being employed the year around. Milk and its products sell for more per pound during the winter than during the summer. The same cows will give more milk by being made to milk 10½ months than by being allowed holidays for five months in the year. It does not pay to allow a cow too many holidays. If you have the cows in use during the winter you will be able to keep more cows on fewer acres, which is one of the things urgently needed in our Canadian farming. By doing that you will attain what we have practically attained at Ottawa—the forty-acre farm. We have kept 29 cows on 40 acres, and I think we shall keep more by and by. We began with poor land—land that had been run out—and we are improving it by the manure we are able to put on it. Now I want to review a few points the observance of which will make dairying even more profitable than at present. The first thing the farmer needs is to be able to manage his cows better; not so much to get better cows, but manage better those he has. The dairying in Ontario does not need better cows, but the dairy cows need better managers. To manage a cow well, a man must understand the cow. What do we

need in a cow? Some say "Constitution." What does that mean? The power to remain in good health and to do things or bring things to pass. The constitutional vigor of a cow depends upon what kind of a skin she has and how that skin is treated. The skin is all one. The same skin that is outside the cow's ribs extends inside the stomach. The nature of the cow is such as to require succulent food next the skin of the stomach, and the man who gives her only dry straw and hay and meal, fights against the constitutional vigor of the cow by putting that skin in an unfavorable condition. Give her succulent food either in the green stalks, in hay and roots or in ensilage. I never knew a cow that would not milk fairly well five weeks after calving if turned out on June grass. Even a cow that is constitutionally disposed to be lazy can be compelled to do better by putting her under favorable conditions. You all know the loss you suffered last summer through the drouth. The cows could not thrive on the dried grass as they would have thriven had the grass been green. The crying need of our cows is succulent feed at the least possible cost to yourselves. Another requisite is good stables. It is no part of my business to recommend you to put up expensive stables with all the latest improvements in the way of fixtures, though I think these desirable if you can afford them. The main thing wanted is warmth—first a warm stable, then a clean stable, then a dry stable, then a lighted stable and then a well-ventilated stable. A good deal of theory has been printed and talked about the cow's need for pure air. Have you ever seen pigs get into a straw stack where they are dry and warm and remain there in an atmosphere that would kill you in five minutes? Recent experiments have shown that an atmosphere so charged with carbonic acid that it would kill a man merely exhilarates a rabbit. I have never found a cow in a warm, clean, dry stable to be in ill health. We do not have to provide means of ventilation in the winter; the atmosphere finds its own way in. I must mention also the advantage of having pure water, not that rendered unwholesome by soakage from barn yards. Get pure water and let the cows have access to it as often as they like. I might cite the case of Mr. James Whitton, a patron of Wellman's Corners factory. In 1892 he got 6,093 pounds per cow in six months, from eight cows, and pocketed $192 from the same cows from the winter dairying station. He has no cows except these, and they are well-chosen cows that have always been fed on succulent food and kept in a warm, clean, dry, light stable. I do not say anything against improving the stock of the cow by grading up, but we can make the greatest step forward now by improving our handling of the cows we have. One word about feed. I have said that it should be succulent. While ensilage is a capital thing for cows and fancy stock, it is not so good for growing stock as hay and roots. Ensilage means a good return from a healthy well-grown cow, but it will not give the same vigorous constitution as will hay, roots and meal. The farmer who grows ensilage should grow some roots and should put some mangels and carrots with his ensilage. A few words about the new ensilage mixture. I have a sample here of ensilage made up of Indian corn, horse-beans and sunflowers. We feed one lot of cows hay, roots and five pounds of meal, another lot ordinary corn ensilage and five pounds of meal and another lot this ensilage and one pound of meal. I am not yet in a position to report definitely, but I think that the cows that get one pound of meal and this ensilage will do better than those that get five pounds of meal and Indian corn ensilage. I want to read a few returns I have had from farmers to whom I sent enquiries on this subject. A good many of you, no doubt, got some of the mixture we sent out; Indian corn, horse-beans and sunflowers. Over nearly the whole of Ontario the horse-beans were a failure last season. That does not prove that horse-beans will not grow well here, but only that they did not grow well last season. In many places your fall grain did not grow well; in many places the oats did not fill out well. In other parts we had normal conditions of temperature and rain and the horse-beans did well.

Prof. Robertson then read letters received from a number of farmers in various parts of the Dominion. These letters showed that where the season was normal the crop had grown well, and the results generally were favorable. He continued: I have read these returns to show that we can grow corn, beans and sunflowers, even though the beans were a failure last year, owing to unfavorable climatic conditions. As to growing corn—I would not grow any kind of corn for ensilage that would not almost make the ears mature. In growing horse-beans in Ontario better results will be

obtained by growing them separate from the corn. Last year, growing beans by themselves, three feet apart, the plants stood all the way from 3½ to 6 feet high. They should be planted with drills three weeks later than the corn. They will then miss the bugs. Following this method we have got an average of eight tons per acre of green fodder. It cost to grow $20.05 per acre, so you can estimate the cost of horse-beans at about $2.50 per ton. In growing them with corn you get the best results by having four-fifths beans and one-fifth corn. The sunflower is less known to many of you as a profitable plant for cattle feed. In the course of my reading I learned that that there was in Russia a large industry in making sunflower oil for distribution all over southern Europe. I learned also that sunflower cake, made much the same as oil-cake made from linseed, was being sent from Russia to Denmark and England and being fed to cattle and preferred by many to cotton-seed meal and oil cake for milch cows and for fattening horses. I reasoned that if they could grow sunflowers in Russia we could grow them here, soil and climate being much the same, and that by this means we could get the oil required by our cattle in our cold winters. They should be planted three feet apart. In this way they will grow with stalks as thick as my wrist and with heads that will hold more seeds and more oil than half-a-dozen small ones. You can depend upon getting from 7 to 7½ tons of sunflower heads per acre, containing 700 pounds of oil. The proportion should be one acre of corn-stalks, one-half acre of beans and one-quarter acre of sunflowers. This will give you the best mixture, and you will find capital results, especially for winter dairying. I understand that the silo has been discussed. I shall speak of it but briefly therefore. Some men seem to think that the silo has some peculiar power of creating things. They put corn that has been badly grown in a poor soil into a silo and expect the silo to work some regeneration. The silo has no power to create anything; its object is to preserve that which is put into it. Get the material for the ensilage nearly mature. At that period things are at their best. In building a silo, what you require is, first, strength, and second, such construction as will exclude the air.

Now as to the handling of milk for winter dairying. Success can be obtained only by observing the utmost cleanliness. We talk about microbes and bacteria whose scientific names do not convey much meaning to the ordinary man, but the fact is that if a man milks with dirty hands into a dirty milk pail and empties the milk into a dirty can he is simply putting into that milk all the abominable long-named things you can think of. But if the utmost cleanliness is observed no microbes will be in the milk except such as are beneficial to health to help a man to digest his food. Microbes don't hurt you unless you get the wrong sort. As Kingsley says in his "Water Babies," the whole economy of life is to help a man to be clean. If a man will have hands and pail and milk can clean he will find himself a cleaner man throughout than if he is careless in these respects. Another reason for supporting the winter dairy is that otherwise there is a great loss of the butter-fat in the milk. Under our conditions most farmers at this season have cows that have been milking for six months. Our experience with the milk of such cows is that by the deep-setting method only two-thirds of the butter-fat is taken, 33⅓ per cent. being lost. The milk of fresh calved cows under the same treatment yielded all but 14 per cent. of the fat it contained. By putting the milk of the first-named class of cows through the separator all but 6 per cent. of the butter-fat was gathered. In our regular dairy work we hardly lose more than 2 per cent. Here is a gain of at least one-quarter of all the butter-fat in the milk when it is handled by the winter dairy, as compared with the deep-setting method. Without the winter dairy the farmer feeds one-third more stock for the same return. By sending the milk to the winter dairy, therefore, you not only receive more money for the cows you keep, but you are able to keep more cows. Doing the work at home, if the farmer attempts to increase the number of his cows he imposes more work on the women folks than they can well take care of. The men on our farms work too hard in the summer and not hard enough in the winter. Our women work too hard in the summer and then try to get rested by doubling the work in the winter. One reason why life on the farm is not what it ought to be is that our women have not the leisure or the time for culture that many women in towns have. To make good butter every detail of the process of manufacture, from the taking in of the cream to putting the cover on

the package must be done as well as possible. I want to say a thing now which probably our cheese-makers will not like. But I have learned to say many things to people that they don't like, and they think the more of me for it when they learn to know me. Last summer I took a census. It was not announced—it was a census of the cheese-makers whose finger-nails were clean. I found only one man in twenty-five whose finger-nails were clean. And these men would put their hands into the curd and afterwards lecture and berate the farmers because their milkcans were not clean. That is only a little thing, but it is a thing in which there is room for improvement. Winter dairying will help us to improve one of the side branches of dairying, the swine-feeding industry. I am told that $200,000 of hog products will be shipped from Ingersoll this year. I wish every station on the line had a proportionate shipment to boast of. There is a steady demand for these products. You can increase your production in this respect only by having the skim-milk and buttermilk from the winter dairy to carry the pigs over from weaning to grain-eating. We selected six pens of pigs for grain-feeding in order to test the different breeds. We had a pen of culls left, not deemed good enough to be included in the experiment. These latter received only a little grain, some skim-milk and buttermilk and the waste from the houses. After feeding for ten weeks the culls weighed about one-half more than the best picked pigs in the other pens. The others were thriving. They gained an average of one pound for every 3 6-10 pounds of grain they received. But the others were the best pigs in lustiness, weight and quality of bacon. Through winter dairying we shall be able to use our coarse grains to advantage. Frozen wheat has been almost unsaleable. It would not bring with us more than 43¼c. a bushel. By feeding it to pigs and turning it into bacon we realized 73½c. a bushel. A pig will stand as much cold as any domestic animal, but if he is exposed to drafts he will not thrive. Keep him dry. Winter dairying will help us to fatten more steers. We made experiment last year in feeding two rows of steers. The first row we fed hay at $8 a ton, roots at $4 a ton and meal at 1c. a pound. The second we fed ensilage at $2 a ton and meal at 1c. a pound. Every pound of increase in the steers in the first row cost 62.95 per cent. more than in the other. I have tried to pack a good deal into this address. I have talked to you as serious men, convinced that you have now before you the best opportunities Canadians have ever had. If we will put these things into practice, the means are afforded in our country for the farmers to make a better living than hitherto.

The PRESIDENT said that before the discussion of Prof. Robertson's address was taken up he would, with the consent of the meeting, ask Mr. John Prain to take the place of Mr. Climie on the Committee on Resolutions, and Mr. Robert Facey to take the place of Mr. C. E. Chadwick.

A MEMBER: I would like to ask Prof. Robertson at what time of the year he took his census of cheese-makers. From my observation I am led to believe that when cheese makers are working they have their finger-nails worn close.

Prof. ROBERTSON: I had no means of calling the cheese-makers before me at any particular time, but I noticed the condition of their finger-nails as I met them through the country for one year. I would like to have every patron watch the cheese-makers. By that means the object in view will be attained.

A MEMBER: Is there any danger in feeding the sunflowers when the seeds are pretty well mature without grinding them?

Prof. ROBERTSON: By cutting them when mature you will not get the full feeding value. You will find the best results from cutting at about the same relative stage as is recommended for corn or beans.

A MEMBER: Have you had experience in feeding sunflower stalks?

Prof. ROBERTSON: The cows would hardly eat them, and they contain almost no nutriment. We therefore try to get them back to the land to return the phosphoric acid they take from the soil.

A MEMBER: What time do you get them in?

Prof. ROBERTSON: About the middle of May, two weeks before the corn, and the beans three weeks after. You want them ready when the corn is ready, otherwise you cannot mix them.

A MEMBER: Why does it take so much longer to churn when the cows are old in lactation than when they are fresh?

Prof. ROBERTSON: The main trouble seems to be that the fat globules are smaller and harder and the milk is more glutinous. There need be no trouble churning if you will ripen the cream properly. Churn it not above 58 or 60 degrees. We never churn longer than twenty minutes and seldom above 57 degrees.

Mr. BLAYNEY: Some patrons with us send their milk to the factory in the summer and in the fall they want to make butter at home. They have great difficulty sometimes.

Prof. ROBERTSON: Let them gather the cream they want to churn and heat it to say 70 degrees and keep it warm. If it does not sour quickly enough mix some buttermilk with it. Then churn in 57 degrees and they will have butter in half an hour. It is said that there is some difficulty about making butter at home on account of the cream freezing. I had some specially frozen, and the sample of butter made from it was pronounced by a Montreal man the best I took down. Even though the cream is frozen, by warming and ripening it you will have as good butter as though it had not been frozen.

A MEMBER: What do think of frozen milk for cheese-making?

Prof. ROBERTSON: It is all right if the proper precautions are taken. Put the milk in a vat and ripen it by putting in some sour whey. Some say if you heat cream to 100 degrees you spoil it. We heat ours to 170 degrees to kill all the fermentations, then let it cool gradually and add the fermentation we want.

A MEMBER: Does not freezing milk prevent the cream from rising?

Prof. ROBERTSON: If milk becomes old in any condition it is difficult to get the cream to rise. The lacto-fibrine forms and prevents the cream globules from rising. But the frost does not make any difference. The separator, however, will bring out the cream even after the milk has got old.

THE PRESIDENT: This discussion reminds me of a remark made when the same subject was touched upon. A clever young maker said to a companion that frozen milk in the can was not a practical question, the trouble was that so many farmers allowed their milk to freeze in the cow. If farmers would take better care of their cows the freezing of milk would not matter so much.

A MEMBER: Do you think that cows thrive on the carbonic acid given off by the others.

Prof. ROBERTSON: No, I do not think they thrive on it. But the cows do not seem to suffer from it. She will suffer if you drive away the carbonic acid by letting in cold air. I do not think it a good thing to have a cow breathing opposite another, but better that than have her breath opposite a ventilator.

A MEMBER: In case of the failure of the horse-bean what should be substituted?

Prof. ROBERTSON: I do not know anything that is as valuable. Sometimes we put in a second crop of clover. But a good plan is to feed bran, cotton-seed meal or oil-cake.

Mr. MACPHERSON: I would like to find a remedy for a disease that attacks calves immediately after they are born. I have lost several calves, and some of my neighbors have lost nearly all theirs. They are attacked with diarrhœa and die within one or two days.

Prof. ROBERTSON: We have not had much experience of that. Our herdsman at Ottawa is a very observant man. He has been in the habit of using rennet extract with young calves that looked at all delicate. One or two teaspoonfuls of rennet extract in the milk we have found a very good preventative of scouring and trouble of that sort. If they are very bad we feed them a few raw eggs.

Mr. MACPHERSON: I would like to hear Mr. Gould on this point.

Mr. GOULD: We do not have much experience of it out our way, but when I was in Maine it was a very serious matter there. The rennet extract seemed to be a good thing. The first thing the little calf got was a dose of rennet extract to help him digest his mess of milk.

A MEMBER: Try flour and water; that will cure the calves.

A MEMBER: Can Prof. Robertson give us a method by which the farmers can keep their butter over and better prices for it?

Prof. ROBERTSON: When farmers hold their butter for higher prices in the fall there is risk that the prices may not be any higher, especially in cheese factory sections where there is a good demand in the season. There is risk also that the butter may spoil because it is not kept in a cool enough place or in an air-tight package. If the farmer can sell his butter, better sell it and not speculate.

A MEMBER: How is it that, as a rule, November cheese sells for less than September and October cheese?

Prof. ROBERTSON: For several reasons. But one will include all the others—it is not of so good quality, and the quality is inferior because the milk is not so good and because the cheese-maker does not ripen it enough. The way to get over that difficulty is to quit making cheese at the end of October and begin making butter.

A MEMBER: What would be the cost of turning a cheese factory into a butter factory?

Prof. ROBERTSON: Nearly $1,000, of which $750 would be for apparatus, including $350 for a separator.

The PRESIDENT: At this evening's meeting you will have further opportunity to question Prof. Robertson. But the time is wearing on, and I would like now to introduce a gentleman on the platform, a venerable man who was connected with the early history of cheese-making in Eastern Ontario, Senator Read, of Belleville. Senator Read is one of those fortunate men who are always young.

REMINISCENCES OF A VETERAN DAIRYMAN.

Hon. ROBERT READ, Belleville: I am not accustomed to public speaking, at any rate to such an intelligent, wide-awake audience as this. Such speaking as I do is done among those old fogies in the Senate. If I am a little diffident, you must ascribe it to that cause and to my youth. I came here because I wanted to see you and hear what was to be said at this meeting. When I was at the Eastern meeting two weeks ago, I made up my mind that if I had time I would come to Ingersoll for this meeting, but I said nothing for fear they would want me to make a speech. I am an enthusiastic dairyman, and have been for thirty years. I never expected in those early days to see the dairy industry of Canada develop to its present proportions. But now I can see that it is only beginning its work. Several years before the Reciprocity Treaty was repealed, I saw that it was the intention of the Americans to take that course. The weevil had got into the wheat, and times looked bad. The question I set myself to consider was: Is there not something we can turn to to keep our people independent, to keep them from begging our American neighbors to trade with us? I heard of this dairy industry in New York State. It was said also that there were one or two cheese factories in this county, not on the joint stock plan, but private enterprises. I was a trader in farm produce at that time; I am now a farmer. I asked a neighbor of mine to go to the United States and investigate this subject, and agreed to pay his expenses. I sent my son with him. This was in 1864. Mind you, I was a trader buying the farmers' produce, and buying it as cheaply as I could. I have seen the time when I was loading ten vessels at one time with barley for the American market. So, you see, I knew how the farmer was getting his money. My neighbor returned and reported that in his opinion we could carry on the industry.

He declined my offer to pay his expenses and paid them himself. I asked him to write a letter to the papers setting forth the scheme. I did not do it myself, you see, because the farmers might have thought I was working in my own interest and against them. When the idea was laid before the public, I offered $100 to the first cheese factory established on the joint stock plan. In 1865 the first factory was established, and I gave the $100. In those days, in the part of the country in which I resided, we were selling our cows to the Americans. They would give us $15 or $18 apiece for our cows, and our people regarded such a sale as a god-send. We had hard times about then. Some people talk about hard times now, but since I have been in Parliament I have seen a bill introduced to authorise the county of Hastings to borrow money to buy seed grain and distribute it among the farmers as a loan. And before it passed other counties petitioned to be included, and so it was made applicable to the whole of Canada and passed in that form. We are not in as bad a position as that to-day. We had had three years of bad crops—1861-62 63. It was at a public meeting that I made my offer of $100 to the first cheese factory. I told them that there was a great future for this industry. The late Chief Justice Wallbridge, of Manitoba, was then a prominent man—Speaker of the House. He told the audience that I had cheese on the brain; my judgment was good in some matters, but in this I was astray. But I have lived long enough to see the idea a magnificent success. I had a farm of 282 acres, and they wanted me to put in some cows, but I told them that, with my business, I could not attend to it. One of my neighbors argued the matter, however. He said he had 100 acres less than I, and he was willing to put in 40 cows. He bluffed me too hard, and I couldn't stand it. I put in 50 cows. That neighbor and myself had more than half the stock in the first joint stock factory built in Ontario. We had a good year. We charged everything we could to capital, and made a flaming statement. Next year two more factories were built in our part of the country. I am as great an enthusiast about winter dairying now as I was about cheese-making then. At a meeting at Wellman's Corners the other day, I made the statement that the farmer cannot hire his labor and grow grain at a profit at present prices. But there will be no loss in keeping cows. I have kept from 40 to 60 cows ever since 1865. My observation and experience lead me to believe that if it had not been for keeping cows, most of us in my section would have had the sheriff in possession by this time. The cow and her products are to be the agricultural exports of this country for some time to come. We are not here as they are in England and Holland; we have not the diseases among our cattle that they have. We have had immunity from disease at the same time that the rhinderpest was sweeping away whole herds in Europe. We have the water, we have the grass, and in every way we are most favorably situated for exporting dairy products. We are sufficiently near the market to secure favorable transportation charges. They used to say that in a few years the English market would be over-stocked. But it is the hardest thing imaginable to over-supply an Englishman with beef, and cheese and beer. The first year we made cheese in a factory (1865) we imported from the United States $360,000 worth of cheese for our own consumption. The fact was we sold them cows to make cheese for us. I need not tell you of the change since then. A good deal has been said about the silo. A silo is the simplest thing imaginable. Last year I had an immense crop of corn, more than my silos would hold, so I built another. I had one man, a carpenter, and I worked with him. We began the silo one day, and the next day we had it finished. Forty dollars will build a silo that will keep twelve cows. Some are afraid of the expense of cutting. Let four or five farmers club together and buy a cutting machine and a horse power. For a hundred dollars machines can be bought that will do the work. While on my feet I want to give a practical hint or two. Some of you have trouble with your cows after calving. I can give you a remedy for fever in such cases. I clipped it from *The Country Gentleman*. Tie the cow in the horse stable, and the feverish bag will soon be all right. The reason is that the ammonia in the horse stable passes through the cow's system and allays the fever. I have tried the remedy repeatedly, and always with success. I am glad to have been here. When I go back I must tell our people that they are not as live as you are. I thank you for the kindness with which you have received me, and for the attention with which you have listened to me.

SECOND DAY—EVENING SESSION.

The President, after calling the meeting to order, asked Dr. Van Slyke, of Geneva, New York, to address the audience.

THE NEW vs. THE OLD.

Dr. VAN SLYKE: Any one would know this was a convention of cheese-makers. The meeting has arrived at the state known technically amongst us as "putting in press." This Convention represents, I will not say the flower, but the cream, I might almost say the butter-fat of Canadian skill and excellence in dairying. Your Secretary, in asking me to come and address you, suggested that I should speak on the same subject as I presented to you last year, and I thought that the choice of a non-committal title like "The New *vs.* the Old" would enable me to deal with almost anything that might be deemed best. I might speak on the "Grandfathers of Dairying and the Present Generation," or "The New Cheese Country, Canada, *versus* the Old Cheese Country, the United States." But on that point I feel a good deal like the man who married a second time very soon after his first wife died, and who was "charivaried" by the boys of the village. He stood the trouble as long as he could, and at last put his head out of the window and addressed the crowd. He said, "Boys, don't you think you're making a good deal of noise for a house where there's been a funeral so lately?" I am here as a mourner, and when you speak about comparisons between cheese-making in this country and cheese-making in the United States, don't bear on too hard. I am to speak to you about the results of our investigations. Two years ago we began an investigation relating to the manufacture of cheese, and, as some new facts came up, it was decided to confirm or modify them by further study in 1893. In these experiments and investigations, extending over two years, we have actually handled a million pounds of milk, representing not less than five million pounds, the product of not less than 15,000 cows supplying some fifty different factories in New York State. I need not talk to you about the method of paying for milk at the cheese factories, which has been used so extensively throughout Canada and the United States. But this brings me to the interpretation of my theme, which is "The Old *vs.* the New" method of paying for milk at the cheese factory.

BASIS OF THE OLD METHOD OF PAYING FOR MILK AT CHEESE FACTORIES.

All cheese factories have, until recently, paid for milk according to weight alone, and at present this is the almost universal method. Each patron receives, by this method, the same amount of money for each hundred pounds of milk delivered at the factory at any given time. This method is based upon the assumption that, for the purpose of cheese-making, milk is milk; that all kinds of normal milk are of equal value for cheese production; that one hundred pounds of one patron's milk will make just the same amount of cheese as one hundred pounds of every other patron's milk. The old method can be fair, only in case the foregoing assumption be true. Now, is it true that one hundred pounds of one herd's milk will make just the same amount of cheese as one hundred pounds of the milk of every other herd? We can answer the question by saying that in our investigation we have found normal milk, one hundred pounds of which made 8.25 pounds of cheese; and, again, we have found normal milk, one hundred pounds of which made 14.25 pounds of cheese. Here is a difference of six pounds of green cheese for one hundred pounds of milk, and between these extreme limits we have found all gradations. No more figures need be presented to show that milk varies greatly in its cheese-producing value, and hence it is not true that one hundred pounds of one patron's milk will make just the same amount of cheese as one hundred pounds of every other patron's milk. The old method of paying for milk is, therefore, founded on a false basis, and it is eminently unfair to pay the same price for one hundred pounds of milk, regardless of the amount of cheese that can be made from the milk.

If quantity alone or weight of milk does not furnish a fair basis in paying for milk for cheese-making, we may ask, what does furnish such a basis? To answer this question

satisfactorily, we must find out what it is in milk that enables one hundred pounds of one milk to make more cheese than one hundred pounds of another milk.

What Constituents of Milk Determine Its Value for Cheese-Production?

Two, and only two, compounds of milk influence and concern the production of cheese, so far as the composition of milk is concerned. These two cheese-producing constituents of milk are *fat* and *casein*. The other constituents of the milk, such as albumen, sugar, etc., pass into the whey for the most part and are lost, so far as the cheese is concerned. The question may be raised that the cheese contains water in addition to fat and casein. The amount of water retained in cheese is quite independent of the amount of water in the milk from which the cheese is made, since the amount of water that is retained in cheese is dependent upon the conditions of manufacture, and the cheese-maker has it in his power to retain more or less water in the cheese. Therefore, we need to consider, in this connection, only the fat and the casein of the milk as the cheese-producing constituents of the milk. The fat that forms so large a portion of natural butter comes from the fat in the milk and it is this same fat in milk that forms the fat of cheese. The casein is familiar to everyone under the name of curdled milk. When milk sours, a solid, white substance or curd forms, and it is this substance that we call casein. In using the term casein, we do not include albumen, as is generally done, but refer only to the compound that is coagulated by rennet and retained in cheese.

If, then, fat and casein in milk have most to do with cheese-production, the question arises: Do different milks contain the same or different amounts of fat and of casein? We know, beyond all question, that milk varies much in respect to the amount of fat contained in it, and also in respect to the amount of casein contained in it. The fat in normal milk may vary from under 3 to over 8 per cent. and casein may vary from under 2 to 5 per cent. If the amount of fat and casein in milk varies, and if these two constituents in milk have most to do with cheese-production, why not use one or both as a basis in paying for milk for cheese-making? One most serious objection to using fat and casein together or casein alone to find out the cheese-making value of milk is this: We have no simple method for determining the amount of casein in milk, and only a trained chemist can make such determinations. But it is well known that we have a simple, effective, cheap and accurate method for determining the auount of fat in milk. Why not, then, use the amount of fat in milk as a basis in paying for milk at cheese factories? Is this method fair as compared with the method of paying for milk according to its weight alone? Does such a method recognize the cheese-producing value of all kinds of milk? Does the fat in milk furnish a satisfactory guide in regard to the amount of cheese that can be made from milk? Is it equally fair to the man whose milk contains 3 per cent. of fat and to the man whose milk contains 4 or 5 per cent. of fat?

When it was first proposed to pay for milk at factories according to the amount of fat contained in it, basing the proposed change upon the belief that fat in milk furnishes a practical basis for this purpose, there was considerable difference of opinion among dairy-students. Some held that fat, being only one of the constituents in milk that enter into cheese-production, could not alone be an accurate or even approximate guide as to the cheese-making value of milk. But it is now the universal belief among those who have studied the question at all, that the fat in milk, while it may not be an absolutely accurate guide as to the amount of cheese that can be made from milk, affords, nevertheless, a basis so much more accurate than any other method employed or proposed that it is the most satisfactory and just guide ever used in enabling one to judge of the value of milk for cheese-making. Now, while this was generally believed by our best authorities in dairy-science, still, no one, up to the latter part of 1892, was able, strange as it may seem, to prove beyond all doubt that the fat in milk furnishes the most accurate and practical basis for judging of the cheese-producing value of milk. Some objections had, up to that time, never been fully met, and the most that could be claimed as proved was that fat furnishes a better basis in paying for milk at cheese factories than the common method of paying for quantity regardless of quality.

The investigation which we have been carrying on for two years has developed a large number and variety of new facts, which enable us, as we believe, to demonstrate

beyond reasonable doubt that fat in milk furnishes not only a fairer basis for judging the value of milk for cheese-making than the method now used, but that it furnishes the most accurate, practical basis, considered from all points of view, that has ever been proposed, or is likely ever to be proposed.

Of course, in its practical application to methods of paying for milk at cheese factories, the use of fat as such a basis depends primarily upon its fairness as compared with the old method. Now, this question of fairness in paying for milk for cheese-making according to the amount of fat it contains depends upon one point, viz.: Does the fat in milk furnish an accurate or fairly accurate guide in regard to the amount of cheese that can be made from milk? For example, taking milk that contains 3, 4 and 5 per cent. of fat; if one hundred pounds of milk containing 3 per cent. of fat makes a certain amount of cheese, will one hundred pounds of milk containing 4 per cent. of fat make a third more cheese than one hundred pounds of the milk containing 3 per cent. of fat? And will one hundred pounds of milk containing 5 per cent. of fat make two-thirds more cheese than the same amount of milk containing 3 per cent. of fat, or one-fourth more cheese than the same amount of milk containing 4 per cent. of fat? Up to a little over one year ago, it was generally held that, as milk grows rich in fat, it will make more cheese, but that the increased yield of cheese will not be in proportion to the increase of fat in milk, and that, the richer milk becomes in fat, the smaller will become the yield of cheese in proportion to the fat.

Relation of Fat to Casein in Milk.

It has been held that fat cannot be an accurate guide in regard to the amount of cheese that can be made from milk, because, when the fat increases in milk, the casein does not increase in anything like the same proportion. Now, is it true that normal milk, poor in fat, contains a larger amount of casein, relative to its fat, than does milk richer in fat?

Bear in mind that fat and casein are the two milk constituents that produce cheese.

To make our question still more specific, is it a fact that milk containing 4 per cent. of fat contains less casein in proportion to its fat than does milk containing 3 per cent. of fat? While we have noticed considerable variation when we considered individual herds, we have found during our two seasons' work that, as a rule, *there were two-thirds of one pound of casein for each pound of fat in the milk*, whether the milk contained 3 or 4 per cent. of fat. This normal relation was considerably affected in the season of 1893 by the effects of drouth upon the pastures. Below we give a tabulated summary of the results of all our work done during the years of 1892 and 1893, including both the work done at the Station and that done at the factories. The milk is arranged in groups according to the amount of fat.

Tabulated Summary Showing Relation of Fat to Casein in Normal Milk.

Group.	Per cent of fat in milk.	Number of samples.	Average per cent. of fat in each group.	Average per cent. of casein in each group.	Average pounds of casein for each pound of fat.
I	3 to 3.5	22	3.35	2.20	0.66
II	3.5 to 4	112	3.72	2.46	0 66
III	4 to 4.5	78	4.15	2.70	0.65
IV	4.5 to 5	16	4.74	3.05	0.64
V	5 to 5.25	7	5.13	3.12	0.61

The first three groups above include all the factory milk we have worked with, the fat in these groups varying from 3 to 4.5 per cent. An examination of the last column shows that, *for each pound of fat, there were, on an average, two-thirds of one pound of*

casein in the milk. When the amount of fat in milk increased beyond 4.5 per cent., as in groups IV. and V., there was a gradual but slight diminution of casein for each pound. of fat. But these two groups do not represent factory milk and, in our actual experience, we shall rarely meet with factory milk averaging over 4.5 per cent. of fat for the season

At one factory we secured samples of milk once each week through the entire season from the herd which gave milk richest in fat and also from the herd which gave milk poorest in fat. The average results secured from each of these two herds during the season were as follows :

——	Average per cent. of fat in milk.	Average per cent. of casein in milk.	Pounds of casein for one pound of fat in milk.
Herd giving milk poorest in fat	3.33	2.20	0.66
Herd giving milk richest in fat	4.08	2.57	0.63

These results show that the milk poorest in fat contained a trifle more casein for each pound of fat in milk; but, for all practical purposes, the results may be regarded as showing uniformity in the relation of fat to casein in factory milk from different herds.

To consider the relation of fat to casein from another point of view, the question has been raised in regard to the relation of fat to casein in the milk of cows which are in about the same stage of their lactation-period. It has been stated that, with different herds of cows in the same stage of lactation, the fat increases more rapidly than the casein. The results secured with the mixed milk of herds during last season in the month of May may contribute something to our information upon this point. During May, samples of milk were received containing fat varying from 3.30 to 4 per cent.

Arranging the results in the order of the fat-content of the milk, we have the following table :

TABLE SHOWING RELATION OF FAT TO CASEIN IN MILK FROM DIFFERENT FACTORIES IN MAY.

Per cent. of fat in milk.	Per cent. of casein in milk.	Pounds of casein for one pound of fat in milk.
3.30	2.21	0.67
3.30	2.18	0.66
3.35	2.25	0.67
3.40	2.18	0.64
3.40	2.28	0.67
3.45	2.22	0.64
3.45	2.26	0.66
3.50	2.28	0.65
3.55	2.33	0.66
3.60	2.25	0.63
3.60	2.54	0.70
3.60	2.33	0.65
3.60	2.46	0.68
3.70	2.57	0.69
3.70	2.46	0.67
3.80	2.44	0.64
3.80	2.44	0.64
3.80	2.51	0.66
3.85	2.54	0.66
3.90	2.54	0.65
3.90	2.66	0.68
4.00	2.62	0.66
4.00	2.66	0.67
4.00	2.64	0.66

The results in the table above show that, while there was some variation, the marked and general tendency was a proportionate increase of fat and casein, or, in other words, that there was a fair degree of uniformity in the relation of fat to casein in factory milk.

It will thus be seen that, whether we take the mixed milk of herds of cows arranged in groups and showing averages of results for a period of two years, or whether we take the season's averages for separate herds of cows, or the results obtained from the mixed milk of herds in the same approximate stage of period of lactation, the results all point to one conclusion, viz. : *that in factory milk there will be about two-thirds of one pound of casein for each pound of fat*, whether the milk contains three or four per cent. of fat. While this general rule does not hold absolutely true in all individual cases, since the fat sometimes increases without a corresponding increase of casein, and since also the casein sometimes increases without a corresponding increase of fat ; still, our results seem to make it clear that the claim is without foundation which asserts that milk poor in fat contains a larger proportion of casein, relative to its fat, than milk richer in fat. We can thus dispose of the objection raised that fat in factory milk does not measure the cheese-producing value of milk because the fat increases more rapidly in proportion than does the casein ; for this objection is not based on actual facts. Such variations as occur are so slight, as a rule, as to make no practical difference when we come to consider the influence upon cheese-yield.

Amount of Fat in Milk Lost in Cheese-Making.

Again, it is claimed that fat cannot be a just measure of the cheese-producing value of milk for the reason that the loss of fat in cheese-making is much greater in case of milk rich in fat than in case of milk poorer in fat. We have worked with normal milk varying in its fat-content from 3 to 5.25 per cent. In the table below we give the averages by groups, as secured in all our investigations.

Tabulated Summary Showing Amount of Fat in Milk Lost in Cheese-Making.

Group.	Pounds of fat in 100 lb. of milk.	Pounds of fat lost in whey for 100 lb. of milk.	Per cent. of fat in milk lost in whey.
I.....	3 to 3.5	0.32	9.55
II.....	3.5 to 4	0.33	8.33
III.....	4 to 4.5	0.32	7.70
IV.....	4.5 to 5	0.28	5.90
V.....	5 to 5.25	0.31	6.00

An examination of the figures in the third column shows that about the same amount of fat is lost in the whey for one hundred pounds of milk, whether the milk contain 3 or 5 per cent. of fat. It will be kept in mind that the first three groups represent factory milk, and the amount of fat lost for one hundred pounds of milk averaged practically the same for each group. The smaller loss noticed in the last two groups was probably due to the fact that smaller lots of milk were used in the work, and it was possible to control the conditions of manufacture more completely.

If we turn to the figures in the fourth column, we see the per cent. of fat in milk that was lost in whey. For example, 0.32, the amount of fat lost in whey was 9.55 per cent., nearly one-tenth, of the amount of fat in the milk. Following the column of figures down we see that, as the amount of fat in milk increased, the proportion or per cent. of that fat which was lost in whey decreased. The proportion of fat lost grew less and less as the milk became richer in fat. In actual experience, it was found to be no more difficult to manage normal milk rich in fat that normal milk less rich in fat, so far as loss of fat was concerned, in the process of manufacture. When a cheese-maker says that he cannot make cheese from milk containing over 3.5 or 4 per cent. of fat without having extra large losses of fat, he brands himself as a thoroughly incompetent maker. Within a year the writer has seen in print and heard confidently stated in public that it did not pay to make cheese from milk containing over 3.5 per cent. of fat,

because all the fat over 3.5 per cent. would pass into the whey and could not be retained in the cheese. The facts as here brought out by our investigation have been fully confirmed by work done at other stations, notably those of Wisconsin and Minnesota. The facts all go to show that it is really more economical, so far as loss of fat is concerned, to make cheese from normal milk rich in fat than from normal milk poorer in fat. *The loss of fat in cheese-making is quite independent of the amount of fat in milk. The variations that occur in loss of fat are due either to the condition of the milk or to some special conditions employed in manufacture or to both.*

Relation of Fat in Milk to Yield of Cheese.

Thus far we have considered the two objections that have been raised to show that fat in milk cannot be an accurate guide in regard to the amount of cheese that can be made from milk. These objections were, first, that milk rich in fat contains less casein in proportion to its fat than does milk poorer in fat, and hence milk rich in fat makes less cheese for each pound of fat than does milk poorer in fat; second, that the loss of fat is very much greater in cheese-making in case of milk rich in fat than in case of milk poorer in fat. In reply to these objections, which are not based upon the results of careful, long-continued investigation, we have shown that the results of our investigation all go to show that the above objections or claims are not based upon actual facts, and are more or less completely false; that, on the other hand, the amount of fat in milk is a fair guide for cheese-production, first, because the fat and casein are, on an average, present in fairly uniform proportions in different milks, and, second, because the loss of fat in cheese-making is not greater, but even less, in proportion in milk rich in fat than in milk poorer in fat.

Now, if the preceding statements are true, it necessarily follows that one pound of fat in rich milk will make as much cheese as one pound of fat in poorer milk, within narrow limits. To show the relation of fat in milk to yield of cheese, we present the following:

Tabulated Summary Showing Relation of Fat in Milk to Yield of Cheese.

Group.	Per cent. of fat in milk.	Pounds of green cheese made from 100 lb. of milk.	Pounds of green cheese made for one pound of fat in milk.
I.	3 to 3.5	9.14	2.73
II.	3.5 to 4	10.04	2.70
III.	4 to 4.5	11.34	2.73
IV.	4.5 to 5	12.85	2.71
V.	5 to 5.25	13.61	2.66

An examination of the last column of figures shows that, in case of milk containing from 3 to 5 per cent. of fat, we shall be able, on an average, to make about the same amount of cheese for each pound of fat in milk; or, in more specific form of statement, there should, as a rule, be made for each pound of fat in milk about 2.7 lb. of green cheese, whether we use milk poor or rich in fat. We can, therefore, find out approximately how many pounds of green cheese should be made from one hundred pounds of milk by multiplying the per cent. of fat in milk by 2.7. These results apply to the milk of factory cows as we have found it in this State.

Before leaving this question of relation of fat in milk to yield of cheese, it is desirable to show *why* the yield of cheese should increase in proportion as the fat in milk increases. This has already been done in a general way, but more specific illustrations will make it clearer. For the purpose of illustration we will take milk containing 3, 4 and 5 per cent. of fat.

TABLE SHOWING WHY CHEESE-YIELD INCREASES WHEN FAT IN MILK INCREASES.

—	Pounds in 100 lb. of milk.	Pounds lost in whey for 100 lb. of milk.	Pounds recovered in cheese for 100 lb. of milk.	Yield of green cheese from 100 lb. of milk.	Pounds of green cheese for one pound of fat in milk.
Fat	3.00	0.28	2.72	.....	.....
Casein	2.00	0.10	1.90	.....	.....
Water and salt	.....	.....	3.63	8.25	2.75
Fat	4.00	0.30	3.70	.....	.....
Casein	2.67	0.10	2.57	.....	.....
Water and salt	.....	.....	4.73	11.00	2.75
Fat	5.00	0.32	4.68	.....	.....
Casein	3.15	0.10	3.05	.....	.....
Water and salt	.....	.....	5.65	13.38	2.67

Taking, first, the milk containing 3 per cent. of fat, such milk usually contains about 2 per cent. of casein. Of the fat 0.28 lb. are lost in the whey, leaving 2.72 lb. to go into the cheese. Of the 2 per cent. of casein, about 0.10 lb. are lost in whey, leaving 1 90 lb. to go into the cheese. The 2.72 lb. of fat and the 1.90 lb. of casein will retain about 3.63 lb. of water and ash (mainly salt) and the fat, casein, water and ash will combine to make 8.25 lb of green cheese.

Again, taking the milk which contains 4 per cent. of fat, we have found such milk to contain, on an average, 2.67 lb. of casein. Of the 4 lb. of fat, about 0.30 lb. are lost in the whey, leaving 3.70 lb. to go into cheese; and of the 2.67 lb. of casein, about 0.10 lb. are lost, leaving 2.57 lb. to go into cheese. The 3.70 lb. of fat and and 2.57 lb. of casein will, of course, retain more water and ash than the 2.72 lb. of fat and 1.90 lb. of casein, as in case of the milk containing 3 per cent. of fat, and, instead of 3.63 lb., they will retain 4.73 lb. of water and ash; and thus the one hundred pounds of milk, containing 4 per cent. of fat, will make about 11.00 lb. of cheese, or about 2.75 lb. more of green cheese than will the same amount of milk containing 3 per cent. of fat. We see the increased yield, in the case of the richer milk, has come from, first, more fat in milk, second, more casein in milk, and, third, more water and ash. which the increased amounts of fat and casein retain.

Again, taking the milk containing 5 per cent, of fat, there will be retained in the cheese from one hundred pounds of such milk about 4.68 lb. of fat and 3.05 lb. of casein, and these amounts of fat and casein will retain about 5.65 lb. of water and ash, making about 13.38 lb. of cheese.

It is important that the reason be made clear why milk richer in fat makes more cheese than milk poorer in fat. The richer milk furnishes more fat and more casein for the cheese; the more fat and casein we have, the more water and ash we can retain. Hence, the increased yield of cheese comes, primarily, from the increased amount of fat and casein, and, secondarily, from the added amount of water these can retain. To use a crude illustration, suppose we represent the fat and casein of one milk by a sponge weighing 3 lbs., and the fat and casein of another and richer milk by a similar sponge weighing 4 lbs. If the smaller sponge retains its own weight of water, or 3 lb., then, under the same conditions, the larger sponge will retain and increased amount of water and in direct proportion to its weight, which will be 4 lb., or one pound more than the smaller sponge. Thus fat and casein, in being made into cheese under similar conditions, retain water in proportion to the amount of fat and casein. The water, therefore, counts as an important, necessary and legitimate part of the increased yield of cheese, when we consider the actual cheese-producing value of different kinds of milk.

Why Fat and Casein are Lost in the Process of Cheese-Making.

Intimately connected with the yield of cheese is the amount of fat and casein lost in cheese-making; and it may not be out of place in this connection to consider very briefly why fat and casein are necessarily lost when milk is made into cheese.

Most of our readers know that fat is present in milk in the form of very minute globules. So small are these fat globules of milk, that five thousand of them of average size, laid side by side, would reach only one inch. These are all scattered through the milk in enormous numbers. Now, when the rennet causes the casein throughout the whole mass of milk to solidify or coagulate, the fat-globules are retained or imprisoned in the solidified moss, just where they were at the instant that coagulation took place. When the curd-knife passes through the mass, immense numbers of the minute fat globules are exposed on every cut surface, and numbers of these fall into the whey and are not retained in the cheese. The more finely we cut the curd, and the more violently we handle the cut pieces of curd, the larger will be the number of fat-globules that go into the whey.

In regard to the loss of casein, the larger portion of loss appears to be in the form of fine particles of coagulated casein, which pass through the strainer when the whey is drawn from the curd. These minute particles can readily be seen by letting a pail of freshly-drawn whey stand until the casein settles, and then pouring off the whey, when a noticeable quantity of finely-divided casein can be seen at the bottom of the pail. This passage of casein into the whey is not entirely avoidable, but is needlessly made greater by carelessness or violence in cutting the curd and in subsequent handling, by agitation while drawing off the whey and by imperfect strainers. The amount of casein that thus passes into the whey averages about 0.10 lb. for 100 pounds of milk.

The Commercial Quality and Market-Value of Cheese Largely Governed by the Relation of Fat to Casein in Cheese.

We have thus far confined our discussion to the one main point, that, in case of factory-milk, the fat furnishes the most accurate guide we have in regard to the amount of cheese that can be made from milk. We will now present briefly some additional considerations from a quite different point of view. It has been fairly established that the relation of fat to casein in cheese largely governs the commercial quality, and, therefore, the market-value of cheese, within certain limits; provided, of course, the different kinds of cheese have been made with an equal degree of skill and from milks in equally good condition. For example, take the market-values of different grades of cheese in any one week and we find an average difference between the best full-cream cheese and the best part-skim cheese of about two cents per pound. Again, the full-skim cheese, at the same time, sells for about eight to nine cents per pound less than the full-cream cheese and from six to seven cents per pound less than the best part-skim cheese. The tabulated statement below will assist in making clear the point we wish to make here:

Kind of cheese.	Market-price per lb. in New York city in Feb., 1894.	Difference in value.	Pounds of fat for one pound of casein in cheese.	Pounds of casein for one pound of fat in cheese.
State factory, full-cream, choice...	11¼ to 11½ cents.....	.....	1.42	0.70
State factory, part-skims, choice...	9 to 9½ "	2 to 2¼	1.00	1.00
State factory, full-skims	2 to 3 " ...	8¼ to 9¼ (full-cream) 6½ to 7 (part-skim)	0.10	10.00

In the foregoing table, we have based the figures upon results of much work actually done in the analyses of "full-cream" and "full-skim" cheese. The "part-skims" are assumed to be made from milk from which one-third of the fat has been removed, and

this supposition is certainly generous toward the "part-skims." To examine the results in detail, it will be seen that in the full-cream cheese there were 1.42 lb. of fat for each pound of casein, or 0.70 lbs. of casein for one pound of fat. In the "part-skims," the fat had decreased, relative to the casein, until these two compounds were present in equal proportions, pound for pound. Finally, in the "full-skims," there are ten times as much casein as fat. Thus, it will be seen that as the proportion of fat to casein decreases or, stated in another way, as the proportion of casein to fat increases, the smaller becomes the market-value of the cheese, because the quality becomes poorer as a result of the decreased proportion of fat and increased proportion of casein. Cheese-buyers judge simply of the commercial value of cheese; according to their standards, cheese is classed as of poorer quality and less value when made from skim-milk, and the greater the amount of fat removed, the poorer becomes the quality and market-value of the cheese. The cheese-buyer knows or cares nothing about the relation of fat to casein in cheese, but his method of classifying cheese agrees, in a general way, with the facts brought out by chemical analyses: and the different points of view from which the cheese-buyer and the chemist regard the quality of cheese lead to the same conclusion, viz: that the quality and value of cheese depend largely upon the amount of fat relative to casein in cheese.

The Market-Value of Fat and Casein in Cheese.

From what has preceded, it must be clear that the increased or decreased market-value of cheese follows more or less closely the proportion of fat in cheese. From data, like the above, we can deduce the comparative market-values of fat and casein. The actual market-value of fat in cheese is from ten to fifteen times the market-value of casein in cheese. On an average, when one pound of fat in cheese is worth twenty-five cents, one pound of casein in cheese is worth two cents. It must be borne in mind that these values have nothing to do with the comparative food-values of fat and casein or with the relative cheese-producing power of fat and casein, but they represent the actual market-value of these compounds. The foregoing facts are presented in this connection to show that the fat in milk is the real guide in regard to the market-value of cheese, quite apart from its being a guide to yield of cheese. If, therefore, in some exceptional, extreme cases, it might happen that the proportion of casein did not closely follow the fat, and that the richer milk did not make as much cheese in proportion to its fat as the poorer milk, then it would follow that the cheese made from the richer milk would contain a larger proportion of fat and would have a greater market-value per pound than the cheese made from the poorer milk. Hence, whether we consider the fat in milk in its relation to amount or quality of cheese-yield, we reach the same conclusion, viz.: that fat in the milk is a very close measure of the value of milk for cheese-production.

Conditions Under Which Fat is not a Measure of Cheese-Yield.

There are two sources of trouble which occur and which may be offered as objections to paying for milk according to its amount of fat. The first point is this: Tainted milk, whatever its cause, will not make cheese according to the amount of fat it contains, since, in making such milk into cheese, large losses of fat usually occur. This has nothing to do with the ordinary composition of the milk, since, whatever the per cent. of fat in milk, the taint produces the same result. The causes which produce tainted milk are under our control. The main trouble comes from receiving at the factory and mixing with good milk a can or more of milk that is known to be tainted. It would not be difficult to show that it would be economy to throw away two or three hundred pounds of tainted milk and pay the producer for it rather than mix it with several thousand pounds of good milk and produce from the whole a smaller yield of poor cheese. It is safe to say that one can of badly tainted milk will cause a loss of from ten to twenty-five cents on every hundred pounds of milk with which it is mixed. The remedy lies in teaching patrons to produce and care for their milk properly and in absolutely refusing to receive tainted milk to mix with and injure good milk. Since the per cent. of fat in

milk is in no way connected with tainted milk, the question need not be further considered here. Suffice it to answer one question which may be raised in this connection: Since tainted milk does not make cheese in proportion to its fat, what deduction shall be made for tainted milk when patrons are paid on the basis of the fat in milk? The answer need not be long or uncertain. The question of amount of deduction for tainted milk should never be reached, because milk known to be tainted should never be received. It should be a criminal offence for a cheese-maker knowingly to receive tainted milk, for its reception and mixture with good milk means loss to every patron. The conditions that produce tainted milk are absolutely needless and remediable, and, therefore, the fact that the fat in such abnormal milk does not serve as a guide to its cheese-producing value s no argument that it is not a true basis in case of normal milk.

The other condition that renders fat in milk an unreliable guide in regard to the cheese-producing value of milk is a careless, ignorant and slovenly cheese-maker. But this condition is easily remediable, and, moreover, affects all patrons alike, so that this really has nothing to do with the question under consideration.

Fairness of the Old and New Methods Compared.

Now, let us briefly compare the question of fairness, expressed in money value, as between paying for milk according to weight alone and according to the amount of fat contained in it. We will, for simplicity, take the milk of two men, when there is a difference of one per cent. of fat—for example, 3 and 4 per cent. of fat. According to the old method they share alike, although one hundred pounds of one man's milk makes over $2\frac{1}{2}$ lb. more of cheese than the same amount of the other man's milk. The value of over $2\frac{1}{2}$ lb. of cheese is divided between the two men, instead of being given to the producer of the richer milk, whose milk alone produced the extra $2\frac{1}{2}$ pounds or more of cheese. Suppose the cheese nets 9 cents per pound, then the account would stand as follows by the two systems:

Table Showing Receipts of Patrons by Old and New Methods.

Per cent. of fat in milk.	Pounds of cheese made from 100 lb. of milk.	New Method. Amount of money received by each for cheese from 100 lb. of milk.	Old Method. Amount of money received by each for cheese from 100 lb. of milk.
No. 1—3	8.25	74 cents	$86\frac{1}{2}$ cents
No. 2—4	11	99 "	$86\frac{1}{2}$ "
In favor of No. 2	2.75	25 "	

It will be seen from the last column that, by the old method of payment, each patron receives $86\frac{1}{2}$ cents, the same amount of money for each hundred pounds of milk. By the new method, patron No. 2, whose milk contains 4 per cent. of fat and makes $2\frac{3}{4}$ lb. more of cheese than does the milk of patron No. 1, containing 3 per cent of fat, receives 99 cents, or $12\frac{1}{2}$ cents more for each hundred pounds of milk than he receives by the old method. On the other hand, patron No. 1 receives 74 cents by the new method for each hundred pounds of his milk, or $12\frac{1}{2}$ cents less than by the old method. By the new method, each receives money for the amount of cheese which his milk makes.

What does this mean? It means nothing more or less than that, on every hundred pounds of milk each of these men carries to the factory, patron No. 1 is allowed to take at least $12\frac{1}{2}$ cents which belongs exclusively to patron No. 2, and which No. 2 should receive, because this extra money comes solely from the additional amount of cheese produced by the milk of No. 2 The old method is, in reality, a system of robbery legalized by common consent and permitted on account of previous lack of know-

ledge and inadequate means of testing milk. The amounts, 3 and 4 per cent. of fat, have been used because they enable us to grasp the difference more readily. But actual observations in a large number of factories throughout the state show that this difference really exists between the best and poorest milk at most factories. But whether such a difference is common or exceptional, the same principle of injustice holds true when the difference is only one-half or one-tenth of a pound of fat in one hundred pounds of milk.

Who Object to the New System?

Wherever the new system of paying for milk at cheese factories has replaced the old, the change has affected different patrons in different ways; and it is safe to say that the same thing will be repeated in every factory whenever the new system is introduced. Those patrons who produce milk containing fat above the average in per cent. necessarily receive more money for their milk under the new than under the old system, because they are paid according to the amount of cheese their milk makes. Naturally they raise no objections to the new system. The patrons whose milk falls below the average receive less money by the new than by the old system. The more intelligent of these accept the situation, acknowledge the superior justice of the new method, and at once begin to inquire how they can produce milk of better composition. The less intelligent, to use a charitable form of expression, attempt to overthrow the new system and return to the old; they miss the extra money of their neighbor that the old system gave them and clamor to return to a method which, they must acknowledge, puts into their pockets money that does not belong to them. These people, as a pretence, generally base their opposition to the new system upon the claim that the Babcock method of testing milk is inaccurate, a point which will be considered later.

Peculiar Conditions Prevailing in the Summer of 1893.

This is an opportune time to call attention to a fact that has caused some unfavorable comment upon the new system in places where it was introduced last summer for the first time. It has been the general experience that, where the old system has been replaced by the new, less trouble has been experienced from tainted milk. Last summer, where the new system was used for the first time, there was commonly more trouble from tainted milk than during the previous year under the old system. The same thing was quite generally true, independent of the system of payment employed. The trouble came from the peculiar climatic conditions prevailing during the summer of 1893, when the pastures were badly affected by drouth and also, necessarily, the sources of water supply.

Again, it was noticed that, as the fat in the milk increased during August and later months, the yield of cheese did not increase in like proportion. The cause of this we have already pointed out and dwelt upon in Bulletins 60, 61, 62 and 65. It was due to the fact that the drying-up of pastures, combined, to some extent, with the hot weather and annoyance of flies, so influenced the composition of the milk that the casein decreased for awhile, even when the fat increased, and did not fully regain its normal proportion during the season. How abnormal and unfavorable the conditions were is well known, but the exact influence of these conditions upon the composition of the milk and the yield of cheese is not so widely known.

Why Should the Old Method be Discarded?

1st. Because it is based upon the false assumption that all kinds of milk have the same cheese-producing value. It fails to recognize the fundamental fact that milks differ in regard to the amount of cheese they can produce.

2nd. Because the method, being founded upon a false basis, is unjust and is, therefore, not business-like. By this system, money which belongs solely to the producer of the better milk is taken from his pocket and transferred to that of his neighbor, who produces poorer milk.

3rd. Because the old system discourages the production of better milk and is a positive barrier to improvement. When milk is paid for by weight alone, then more money can be gained by increasing the amount of milk produced, without regard to its composition It is a well-known fact that under this system the composition of milk has deteriorated in the last generation, and, so long as a premium was offered for increasing the amount of milk produced, there was no inducement to pay any attention to the composition of the milk, if only it met the legal requirements.

4th. Because the old system encourages the addition of water, removal of cream and all similar forms of dishonesty. When quantity and not quality is paid for, some will be found who will try dishonestly to take advantage of the system; and this can hardly be surprising, when the system itself is founded upon an untruth, and is itself dishonest.

WHY SHOULD THE AMOUNT OF FAT IN MILK BE USED AS A BASIS IN PAYING FOR MILK AT CHEESE FACTORIES?

1st. Because the amount of fat in milk offers the most accurate, practicable and just basis we have for determining the cheese-producing value of milk as shown:

(a) By the fact that the two cheese-producing compounds of milk, fat and casein, are present in factory-milk in fairly uniform proportions, such variations as may exist being too slight to affect practical results.

(b) By the fact that in making rich milk into cheese, the proportions of fat lost is smaller even than in case of milk poorer in fat.

(c) By the fact that each pound of fat in rich factory-milk will make as much cheese as will each pound of fat in poor milk, within narrow limits.

(d) By the fact that the fat in cheese is the constituent which most largely governs the commercial quality and market-value of cheese, on an average fat being worth 25 cents and casein 2 cents per pound in cheese.

2nd. Because this method recognizes the fundamental truth that different milks possess different values for cheese-making.

3rd. Because this method, being based upon the truth, is just to all and is, therefore, in the highest sense, business-like. It guarantees pay for what is in the milk that makes cheese.

4th. Because the adoption of this method will result in an improvement in the character of the milk-production. Why? Because it offers an inducement to each dairyman to improve the composition of his milk. It puts more money into the pocket of the man who produces the better milk. This improvement will be realized as a result of more careful selection of dairy-animals, more attention to breeding, more intelligent and economical feeding, more humane treatment of dairy-animals and better care of milk.

5th. Because all temptation to adulterate milk by watering or skimming is removed, since a man receives pay for just what he furnishes that is of most even value for cheese-production. The statement sometimes made that a man could furnish milk made abnormally rich by adding cream to milk and thus receive money for much more cheese than such milk would make is rather frivolous, since such tampering, if carried on to a paying extent could be even more readily detected than heavy skimming or watering.

6th. Because the adoption of this system lies at the very foundation of the future improvement of the dairy industry. Nothing will so quickly open the eyes of dairymen and show them the need of improvement in milk-production as the application of this system to their herds and individual animals.

7th. Because improvement in the character of dairy-animals and in the consequent yield and composition of milk means economy of production and increased profit. Our investigation with different breeds of dairy-animals has emphasized the fact that a pound of fat in rich milk is produced at a lower cost than in poorer milk. It would not be difficult to show that it would be easily possible within a few years to increase the yield of our annual cheese-product by an amount equal in value to one million dollars, with fewer animals and at an actually less cost than at present.

The PRESIDENT: You are at liberty now to ask Dr. Van Slyke as many questions as you please.

A MEMBER: Have you any explanation of the smaller proportion of loss of fat in the whey in case of the richer milk.

Dr. VAN SLYKE: We had smaller quantities of the richer milk and under such circumstances we have generally found that there is less loss. Another explanation that occurs to me is that the fat globules in the Jersey milk are larger and fewer in number than in the milk ordinarily used. But I think the first explanation is probably the truer one. The first, second and third classes on the chart represent work as we found it in the factories, and the other two represent special work.

A MEMBER: Would there be any difference because of using a large quantity of rennet in the spring and less in the fall.

Dr. VAN SLYKE: We have made many experiments to learn the effect of different quantities of rennet upon the loss of fat. We find very little difference, but, so far as there is a difference, we find there is a slightly larger loss when a large quantity of rennet is used. I do not state that as a positive conclusion, but only say that our work points that way.

A MEMBER: Suppose a person takes say half the cream from the night's milk and adds it to the morning's milk, sending the mornings milk to the factory and keeping the other say for feeding calves, is it not possible for him to get pay from the factory out of proportion to the work he does for the factory?

Dr. VAN SLYKE: Such milk would be abnormal. It would not make cheese in proportion to the fat, for it would not contain a proportionate quantity of casein. Bu it would make a better cheese, for the quality of cheese depends upon the relation of fat to casein—the larger the proportion of fat, the better the cheese. But such milk would test so high as at once to arouse suspicion.

A MEMBER: Would one be justified in doing that sort of thing under the system of paying for milk by the butter-fat test.

Dr. VAN SLYKE: No; the system assumes that the milk shall be normal. To bring any other kind of milk is simply a fraud.

A MEMBER: Do we understand you to say that the loss of casein in manufacturing is ten per cent!

Dr. VAN SLYKE: No—one tenth of one per cent. Perhaps I ought to have explained that when I speak of casein I do not mean casein and albumen. In most of the analyses of milk "casein" includes both casein and albumen, but in cheese-making a distinction must be made, because the albumen and the sugar have nothing to do with the yield of cheese. They are not acted upon by the rennet as the casein is.

A MEMBER: Are the records of these experiments in printed form?

Dr. VAN SLYKE: Yes, all are published and sent out or ready to be sent out. If you will drop a postal card to the Experimental Station, Geneva, N.Y. asking for the cheese bulletins they will be sent to you, with possibly one or two exceptions, these having run out.

A MEMBER: Do you think any cheese-maker can use the Babcock test without practical experience?

Dr. VAN SLYKE: You cannot do any thing requiring skill without experience. There is such a thing as rushing into the new system of paying for milk too quickly. There must be certain preparation for it and that preparation should be thorough, otherwise great injustice may be done to the system. The system is all right if it is properly used.

A MEMBER: It is claimed by some that they can skim the night's milk, add the cream to the morning's milk and get just as much money for the morning's milk with this addition as they would for both night's and morning's milk together. Can that be done?

Dr. VAN SLYKE: That could only be determined by a calculation of the weight of the milk and the quantity of fat. But one point is clear—the person would take a less weight of milk to the factory.

The PRESIDENT: I am sure you would be glad to hear the opinion of our old friend Hon. Thomas Ballantyne on this question of paying according to the butter-fat test.

VARIATIONS IN MILK.

Hon. THOMAS BALLANTYNE: I hope this subject will be fully discussed, for we have now reached the point when the problem must be dealt with. Any intelligent dairyman, particularly those who read the dairy periodicals, recognizes how unfair and unjust the present system is. As the professor has said, we assume under the old system that a hundred pounds of milk is a hundred pounds for the purpose of cheese production. But we know that this is not the fact, and that some milk will yield more cheese than other milk. But we are told that the cheese-makers are not now capable of applying the test. There is no reason why they should remain in ignorance one hour. What we recommended seventeen years ago is now an accomplished fact in the dairy school at Guelph, and those who feel that they are in need of instructions should take advantage of the opportunities there presented. I, myself, in connection with our own factories have been paying for milk according to the butter-fat test. We found at first that there were some who objected because their cows were rated low. In two different districts were two grades of Holstein cattle, one rating above the average and the other very low. Of course the owners of the latter were dissatisfied. They took samples of the milk to the health analyst at Stratford to have a test made. I have no doubt that they are now convinced that they are getting all that they were entitled to. It is true the new system involves more labor and more book-keeping. But that is all the better for it secures a better class of men for our factories. Without the highest intelligence we cannot continue to improve as we have done in the past. In connection with the dairy test in Chicago last year we found that the same animal would vary very much from day to day in the percentage of butter-fat. To-day a cow would rate 4.5 and to-morrow the test would show only 3.5. It is almost impossible, therefore, to detect adulteration of milk if it is skilfully done and, under the old system, there was a constant temptation to adulterate. How are you going to prove that a man has tampered with his milk? We have no standard. But, with the Babcock test a man is paid according to the quality of his milk. It is to Dr. Babcock that we are indebted for this great improvement. Under the old system, when we found a man's milk running below the average we took a sample of it, and the fact that it was only three per cent. where formerly it used to be four we considered sufficient evidence before a magistrate to convict. I was one of those who always had a horror of that sort of decision. I have often said that I would rather let many guilty men go free than take any chance of convicting and thus injuring an innocent man. These prosecutions were the most painful thing that I know of in connections with factory management, for conviction of a man meant disgrace upon himself and his family. I regret I have not with me a copy of the *Breeder's Gazette* showing variations of butter-fat of these 75 cows tested at Chicago. But this variation applied to all the breeds. I had a cow there myself, and she would vary from one day to another probably one per cent. of butter-fat. We are not yet able to account for these things. If such variations were shown there, it is even more likely to be found in practical work, for these cows were kept as nearly as possible in the same conditions from day to day. They were fed and watered to a minute, milked to a minute and by the same individual, and a chemical test went on along with the other. And that test proved conclusively the correctness of the Babcock machine. The chemical analysis of milk showed results so nearly like those of the Babcock test that, towards the end, the chemical test was discarded. I hope every intelligent maker will qualify himself to make this test. Do not feel that your work is inaccurate simply because the readings vary from day to day or from week to week. Learn the system thoroughly, do not leave a point you

do not understand, and, no doubt, in a short time we shall not have a factory that does not pay by the butter-fat test. The system will improve the quality of milk brought to the factory. We were talking and lecturing in our factory about airing the milk to bring it to the factory in proper condition, and until we adopted this test we never could get the patrons to treat their milk properly. Last season the milk reached us in better condition than ever before, notwithstanding that there was such drouth as to make the season an unfavorable one. I was delighted with Prof. Dean's remarks this afternoon. They were of a practical and business-like character. I trust that these hints given you by the various speakers will be taken advantage of for use in your general practice.

The PRESIDENT: What you have come for mainly is to get facts, the results of the experience of practical men. I see here a gentleman, an old Oxford man, who has gone away from Oxford and who, like other Oxford men who go away, has been put in high position. I refer to Mr. Robert Parker, President of the Elma factory; I believe they pay by the butter-fat test, and I would like him to give us his experience.

THE BABCOCK TEST AS AN EDUCATOR.

Mr. ROBERT PARKER. I would like to relate an incident which came within my know ledge. One of our patrons was finding fault with the Babcock test. I advised him to send better milk. He said he could not send better milk than the cows gave. I found out that he strained the milk into the can and let it stand until next morning. I said to him: You find in the morning the cream has risen to the top. Put a dipper in and try to mix that cream back into the milk, and you will find that you cannot do it. That is the kind of milk that does not test very well. I have stood at the weigh can when your milk and others, were coming in and have noticed these little pieces of cream did not get into the dipper unless you fish for them. So your milk does not test according to its value. I urged him to take better care of his milk, to air it, to cool it down and keep the cream stirred into the milk. He tried the experiment. I saw him on Saturday and told him his milk had risen considerably in the test. He was astonished and pleased as well. Now there was a man who had been a member of the Association for years and yet was quite ignorant of the proper method to be followed in taking care of his milk. That is one great point of the Babcock test—it educates the farmers to take better care of their milk. There was another incident in connection with the Bluevale factory. They sent their directors down to our annual meeting to find out how the system was working in our factory and to ask whether it was giving satisfaction. We asked the chairman to take a vote of our meeting. The chairman called for a rising vote of those in favor of the Babcock test, and every person in the meeting rose. This is our second year of using the Babcock test. When I went there there were large whey tanks in the yards where we fed the pigs, with a substance on the top that I have no name for. It was a kind of butter-fat, and the cheese-maker used to skim it off, boil it down and sell it. We have been selling the whey, but of late years it has been so poor in fat that the cheese-makers will not try to boil it down and sell the fat.

The PRESIDENT: That is the experience of the great Elma factory, which last year got the highest prize for cheese in the whole Dominion. We must admit that that is good evidence.

Mr. BLAYNEY: Do you believe in sending home the whey in the cans?

Mr. PARKER: No, we have not sent it home in the cans since I have been there.

A MEMBER: I would like to ask Prof. Van Slyke if in testing he always had the milk at the same temperature before adding the acid.

Prof. VAN SLYKE: Yes, the temperature was from 65 to 70.

The PRESIDENT: I will ask you now to listen to the experience of a man who controls from 50 to 100 factories, Mr. Macpherson.

Mr. MACPHERSON: I listened to Prof. Van Slyke's address with the greatest interest. I think it was the most convincing address on the subject I ever heard. He has given us the facts of the case, and I can not see how any one can leave the room doubting the accuracy of the Babcock test after such conclusive evidence. Let me say in connection with the variations in milk shown by the Babcock test that there may be preventable causes. I remember one case which I would like dairymen to consider. One of my patrons is sending in a large quantity of milk every day. The test for a time showed the quality to be much below the average, and he complained about it. I investigated the matter, asking him a number of questions. One question was as to the quality of water supplied to his cows. He was not sure about it being all right, and in fact I found that they were drinking stagnant water. I asked him to prevent his cattle drinking from this source and to supply them with pure water. He did so, and the result was that his next dividend showed the quality to be above the average and this quality he has kept up ever since. As to the care of milk, there is nothing that so generally affects the quality of the cheese produced as lack of attention in this matter. If the milk is not stirred, and the cream is allowed to form a leathery surface upon it, that cream can never be reincorporated with the milk, but to a great extent passes off in the whey. And not only that but it retains in the milk the animal heat and tends to create a putrifactive ferment, which causes the porous curd, which gives so much trouble in our factories. And so the man who devotes care to his milk, not only benefits himself directly, but he assists in improving the quality of the cheese and so to increase the price that is paid for the product. This Babcock test is one of the greatest improvements in our factories. It enables us to make better cheese and more cheese for a given quantity of milk.

A MEMBER: Do you pay by the Babcock test in all your factories?

Mr. MACPHERSON: Not in all. I have about fifteen in use this year. We found it just as has been suggested that when a patron kicked it was almost a confession of dishonesty because he wanted to get more than was fairly coming to him. That was the way I put it to them, and they generally stopped.

Hon. Mr. READ: I have had a little experience of the Babcock test and I must admit that I was a kicker. The Dominion analyst asked me to send samples of milk once because the Government were trying to find out whether it would not be in the interest of the public in towns and cities to pass a law providing that all milk sold in these places should be up to a certain standard of butter-fat—about 3½ per cent. An officer of the department came to my place, and I gave him samples and took him around to a number of patrons of the factory to which my milk was going, and he took samples of the night and morning milk and sent them down. After a time the results were made known to us. I knew I was a good feeder, but to my astonishment the milk I sent did not show up well in the test. We came out the worst and some of my neighbors who had smaller herds and who I knew were not as good feeders, for some reason tested better. We had a test made in the factory also and found that my own and my neighbor's milk was the lowest—3.26 and 3.24 per cent. So I am a kicker. I do not complain of the tests, for both the factory and the Dominion analyst showed about the same result. I have received $2,300 for milk I have sold in a year. We have to admit that Ingersoll cheese sells for ½ cent a pound more than ours, and from the intelligence I see displayed in this audience to-day I do not wonder that you have been doing so well.

The PRESIDENT: I would ask Professor Robertson to say a few words.

Prof. ROBERTSON: Like you I have been delighted with the treatment of this rather difficult subject by Prof. Van Slyke. It is not often that a man brings to the elucidation of a problem quite so many facts marshalled so as to convince the judgment of those who may be opposed to him at the beginning. I am glad indeed to know that the work of Dr. Van Slyke agrees almost mathematically with the work we have been carrying on for the past two years. The great feature of Dr. Van Slyke's address is the convincing manner in which he has presented his facts. It is not enough to tell the people that this method is fair, and leave them to follow that dictum. They must have reasons given them. I find the farmers generally ready to do what is right. The work we have been carrying on is not so thorough from a chemist's standpoint, but it is almost as large

from a cheese-maker's standpoint, and the results agree almost identically in establishing that the cheese-making quality of milk is in proportion to the butter-fat. We are indebted to the people on the other side of the line for a great many good things not only in our conventions but in the affairs of ordinary life. These gentleman come, like our friend Mr. Gould, with whom I was associated many years ago, to give us the best of their thought. Dr. Babcock, with most unusual generosity, gave to the world freely his invention now known as the Babcock test which would have made him a millionaire if he had held it. But he is a richer man to-day than if he had ten millions to his credit in the bank but had failed to win honor which is now given him. Besides Dr. Babcock we find able, painstaking men, like Dr. Van Slyke, devoting their best years to the work of making Dr. Babcock's invention servicable not only to the butter-maker but to the cheese-maker as well. We find that the brotherhood of humanity is higher than national division, and we hope it will wipe out those lines of division which are too prominent. Get your patrons to examine the facts so that they may be convinced, and you will find that they will accept the change, you will find every one declaring that he does not want more than his own.

The PRESIDENT: I feel much disposed to leave the remainder of the programme to yourselves. There are several gentlemen down for addresses, but perhaps it would be better not to have others speak at length to night. To-morrow I shall call upon Prof. Fletcher, as I think it would be more just to him than to ask him to address you at so late an hour. Mr. Gould was to speak this evening but he is going to wait until to-morrow. (Cries of "Gould, Gould.") Well, I will call upon Mr. Gould, he must take it as a compliment that you insist upon hearing him.

STABLE LIFE OF A DAIRY COW.

Mr. GOULD: I take it as a great compliment, for it is time all honest men were at home; at least it would be in "America." I shall use my manuscript for a few minutes and we shall get away all the sooner. I am to speak to-night on "The Stable Life of a Dairy Cow":

It is now conceded, we believe, that the environments that we place about a cow in the way that we feed her, and care for her, are equal in importance to the breeding, for breed as we may, if there is not feeding, and care to correspond, there will be a failure of the other; for look at the matter as we may, the food is the source of all profitable returns from the dairy, and even food must have an ally in the form of stables, and sanitary conditions of high order, or there will be a wastage of food material, or demand for extra supplies of nutriment, to make good a demand that could have been met quite as well and far more inexpensively with well appointed stable environments.

At the start one must understand that a very close relationship exists between the bodily comfort of a cow, an enjoyable condition of contentment, and large performance at the pail; and what is more, the nearer we approach the ideal June day in balmy breezes, a condition of temperature that makes life a luxury of living and pastures a delight of grazing, is the desideratum in dairy performance. And to-day it is the best paid dairyman, who nearest in food and well appointed stables extends the summer life of the cow to the extent of giving her as nearly as possible 365 days of summer. When this is secured, we find that the cow that pays us best, is the one that gathers her subsistence in the shortest time, with the least exertion, longest chews her cud in happy contentment, and in no sense is compelled to be forager, and in her bovine intelligence scouts the tradition that she needs to be made hardy at any time of the year by an exercise that combines with it bodily discomfort or unneeded exposure.

Ideal stable life of cows is one that nearest approaches a summer day, plenty of appetizing food, stables light and warm, abundance of pure air, a comfortable bed, and, if you please, made homelike, as our cow is largely artificial in her present relations to the dairy. Habit to her is now also largely developed; make this home habit conspicuous, and while we in reality stable a cow to gain greater commerce in the way of

increased production, this increase actually comes from the owner's contribution to the better development of what is now recognized as the dairy temperament, which being interpreted, means the cow's maternity. The cow is a creature of beneficence, one whose office is ever to give, first to the calf to which she has given life, then to the man who owns her. This last gift is the base of all dairy commerce, and the better this man's understanding how he may stimulate and prolong this beneficence of the cow, the greater will be his reward. This seems to indicate that the best dairyman is the man who best takes his place as this cow's adopted calf, and by good understanding induces the cow to continue in large milk flow and to prolong it. Thus we see that when the stable life of a cow means the continuation of the summer months, making the season from fall to spring a period of warmth, comfort, milk sustaining foods nearly like summer succulence, good, not too cold water and quiet, regular treatment, we after all are only contributing in marked degree to this cow's motherhood, which in its best development, is the largest expression of successful and profitable dairying. The common idea is that a cow is only a machine to do a certain kind of work, and that cow material on the one hand and iron mechanism are not unlike, and that a cow, like an old mowing machine, can stand any amount of exposure. But a large share of failure comes from this utter disregard of the fact that a cow is flesh and blood, has feelings, and strong maternal instincts, and the further idea expressed by good John Wesley that she may have a soul, may not be so heterodox as many suppose. While civilization is carrying mankind up to and on to higher planes of development and enlarged possibilities of performance, it is not beyond the range of possibility that when man was given dominion over the beasts of the field, his development should carry with it the development (by laws not wholly unlike) of the animals under his charge, and the wonderful dairy cow of to day is an exhibiton of that dominion. If we notice closely, we will readily discover the fact that the nearer this cow has full and nutritious feeding, comforts and housing, protection from unnecessary exposure, in fact care and conditions allied to the ever bettered conditions of humanity, the better she is and the greater her intelligence. The scrub cow to-day, is a scrub because of a lack of understanding on the owner's part, and leaving the cow and nature to have it out between them. The highest civilization of the day is so because of artificial substitutions. An Indian and a scrub cow are as they are because they live so near to nature's heart.

Wild horses, wild cattle, Texas steers, elm peeler hogs and the like, are nature's products. These are the results of farms without barns, stock that is in constant change of feast and famine, a sport of the elements and the tyranny of brute force. In this there is a never-ending loss of life, destruction of food, a war with elements that at last is simply a struggle for actual existence. The highest type of animal industry to-day is to impose conditions upon nature that turn, as nearly as possible, all her blanks and wasteful ways into certainties, economize where she is prodigal, protect where she desires it, in fact, sell the results thus saved, that nature must otherwise, if in full power, demand for self-preservation, and this now constitutes profitable dairying. It has been my good fortune to live on this terrestrial sphere for fifty years. I have been a dairyman fifty years. It has been my good fortune to see the evolution of the stable in Ohio from its rudest form. I remember when my father did not stable his cows—and sold cowhides in the spring. It was not profitable dairying, but it gave the spring trade a start. Some years after, these cows were taking hay at the stack in the winter. Some time in the spring we would begin to find frozen calves. When I was nine years old the idea developed in Ohio that cows should have a stable. But we thought that cows needed fresh air and we knew they could get most of that out doors. The idea was to give them "natural conditions." A little later it was thought that after the 1st of March a cow might safely be left all night in a barn. Then we came to the conclusion that a cow might be safely fifteen hours in the barn. We still clung to the idea of fresh air and exercise. In 1865 I first on our farm conceived the idea that all that was needed was to lead the cow out to water and then take her back to the barn. And now in our stable and in many others, the temperature never goes below forty, and the cows stand there twenty-four hours and fifteen minutes every day from the 15th of November to Easter Sunday. Then, when the children have their speckled eggs to play with, we turn the cows out (if it is pleasant) to get the air. Out

of this development of the stable has grown all that is important in dairying. The idea of the motherhood of the cow is, after all, the basis of good dairying, and the man who best recognizes that idea and treats the cow accordingly achieves the greatest success. When shall we begin to fit our cow for the stable? About a year before she is born. But perhaps I had better build the barn before I put my cows in it. I am very much of a crank on barn building. The barn should be "L" shaped, so as to have the greatest light and heat. I have no objection to the two or three story barn, but I have no use for the stone wall to which to tie the cows. The stable should never be made a dungeon. It should be absolutely free from drafts, yet should allow the fullest ingress of fresh air. By making the barn "L" shaped and placing it the proper way, we can have windows on the east, west and south. The barn should have plenty of room for storage and the cows should be surrounded by their food. Two thicknesses of boards on a studding allowing for a six-inch air chamber makes the warmest and most comfortable barn. I have never known the frost to get through that. But in a stone barn I have seen the water trickling down the walls and the cows near the walls standing there shivering. When the cow shivers that means a quart or two less milk than usual. The question with us was, what should be done with the old barn? and we decided that it was the place for deep silos and big hay mows. The "L" part of our barn is 42 x 32 feet. I wish we had made it 42 x 42. The dairy cow demands 550 cubic feet in which to stand. Have plenty of windows to let the sun in from the east during the forenoon, from the south during the middle of the day and from the west in the afternoon. Now as to the floor; I think the best floor is the clay that was dumped there some six thousand years ago. That floor is dry and warm and the wind doesn't blow under it or through it. Some may say that the cows will stand in the mud. No, they won't; they know better. In the first place the cow must be made thoroughly comfortable, and to that end the stanchion must go. Tie the cow up with a halter. Put two cows in a half box stall, head to head, and at least four feet apart. Then have a good gutter, it will help to keep the stable clean. Have a grating on the gutter if you like, but for my part, I am not particular. You need an absorbent to keep the stable sweet-smelling. Nothing is equal to fresh horse-manure for this purpose, and it is always handy. Then the two manures are mixed and you get the best results out of that. I said a moment ago that the training for stable life should begin a year before the cow is born. When shall the little calf appear in this world? I think the early days of October about the best. The reason why we favor that time is because milk is higher in the fall. I'll not say anything about the breed except this—that we all know that the better bred the cow the better will be the results. Milk is an expensive thing to feed a calf with when it brings a high price. But, for the first month it will be better to give it sweet warm milk. After that skim-milk and flax-seed jelly will get the calf in good condition by the time the winter comes, and then we have ensilage and roots. Don't treat the heifer calf as you would a steer. You want to put fat on the steer, but not on the heifer. You want to feed her in the direction of the dairy cow. You want to keep her thrifty and keep her growing, but without an ounce of fat. A man in Southern Ohio asked me once how to feed a heifer calf. I told him to feed her just as he would his running colts. Why? Because the same elements that give the horse the power to run in 1.56 are the same elements that enables a cow to give two pounds of butter a day. Give her whole oats, a little fine hay, shorts—these things that will build up bone and muscle. The calf had better be in the barn the first summer. It costs a lot to feed a big breed of flies, and by keeping the calf in the barn we avoid the flies, and we can handle the calf just as we want to. When she gets to be a year old let her run in the pasture to a certain extent, but still keep up the dairy influence. When should she come into the dairy? I have a little objection to too early mothers. But, on the other hand, the younger the heifer can be brought into the dairy the quicker the milking habit will be developed. But, again by bringing her in too soon you prevent growth. Altogether, the heifer that comes in at 26 or 28 months is early enough. Before she comes into the dairy I want her to run with the dairy, for I want to break her in to milking before she has been milked. A tremendous lot of heifers are spoiled in breaking. Let her go into the barn with the cows and take a similar place. Let her teats be handled before she comes in. Then

when she does come in she has cow habits. Why? Because you teach her cow habits. Last fall a two-year old heifer came in two or three weeks before I expected. I found her in the middle of a forty-acre lot with her calf. I milked her right there. If I had waited she would have been milked with a rail on both sides and her feet tied together, and even then she might have got loose and kicked me out of the window. I am glad to hear questions relating to winter dairying discussed here to-day. Some people have told me they are scared we will overdo this winter dairying business. Suppose we all resolved to be dairymen to-morrow, it wouldn't increase the output, for there would be no more cows than there are to-day. It will take some time for the animals to be born, and then half of them won't work in the dairy—they ain't built that way. You are not going to overdo the winter dairying business. Carry on your dairy with a dairy cow in a dairy barn. When shall we begin to stable our cows in the fall? Stable them all summer—that is, tie them up to milk them and give them their extra feed in the barn. Five dollars worth of barn during the summer is worth twenty-five dollars worth of dog. Put the ration, whatever it may be, into the manger where each cow can get her share. You want to feed her quietly and not on the run. As fall comes on there come stormy days with chilling rains Keep the cows in on such a day and give them a little extra ration. Last fall I commenced tying up our cows at night on the 10th of October. About the 1st of November keep your cows in the barn about all the time. Don't send them out in the pasture. If you do, what do they get? They only walk off what you have been feeding them, for the grass at that season is no use. Practically begin your winter feeding at that time. About the 15th of November put the cows in the stable and shut the door. It is said the cow wants exercise. How do you know she does? It is said she wants fresh air? You can give her fresh air in the barn. We have a nice arrangement for ventilation. The air comes in at one end under the sill where it does not blow on the cows. Don't ventilate your barn at the top, for that will draw off the warm air which rises to the top. Draw off the foul air from the bottom. Cows need exercise, but to give them exercise means loss of milk, which means loss of money. You make the conditions as near like outside as possible, and then let her "tend to her knitting," and that's giving milk. If you observe her you will see that while she is giving milk she is not gaining in flesh, and that is the same result as you find in the horse that does a good deal of travelling. Give as near outdoor environment as possible, and let her take her exercise next summer, when grass is cheap. I told you about letting the cows out costing money. A couple of weeks ago, one of those warmest days, I was away and the hired man was in charge. He said to himself: I don't believe this nonsense about keeping the cows in the barn. I am going to let them out while I go to dinner. He did it. I came back Saturday, and he said: "John, I've got a confession to make." "What is it, Jim?" "On Wednesday I let the cows out just one hour. That night and the next morning the milk was just two pounds a cow less than usual, and I've given them a hundred pounds of meal extra." "Well, Jim, have you learned the lesson?" "I guess so, John." "Well, it's cost me something, but now you've learned it, I'm satisfied." Another thing is to give the cow her rations regularly. Mr. Macpherson spoke of working to a plan. A man in a winter dairy must work to a plan, and that plan is regularity. Another thing we have found out at our house is that cows fed twice a day in winter do better than those fed three times a day. Give the cow all she will eat twice a day and then give her a chance to digest what she has eaten. You say that in the pasture cows eat oftener than that. I have known cows that had to eat all the time or starve to death. If she eats twice a day she eats up clean what she gets, and the rest of the day she chews her cud and has a good time. Then as to water. We do not warm the water any more, but we come near it. We pump from a well into an iron tank in the stable. This tank has a tight fitting cover and holds about forty barrels. The water is about at the same temperature as that in which the cows stand. In front of the manger is a deep trough the whole length of the manger. We water our cows in the day time, but not at night. We try to plan so that the cow can lift the lid and drink whenever she pleases. We find they take a mouthful of water and a mouthful of meal alternately. The troughs are boxed over and for two hours after the cows have eaten we close the troughs. After the cows have chewed the cud for two hours we let them drink

again. I might say a word more as to the ration we feed these cows. In my former address I pretty nearly indicated that I was a believer in ensilage. We do feed some of it in our barn. We have been feeding it from fall to summer. This year we will feed it through the summer. Some of my neighbors fed it last summer and their cattle never knew there was a drouth. I have given you a general idea of what the stable life of a dairy cow should be. Winter dairying is to be the great future of this industry. We must do all we can to understand it. We must make the conditions of the cow in the stable as nearly those of summer as possible. There must be equality of temperature and regularity of feeding and milking, and then the results will be regular. When we lay aside what our fathers taught us, and get at the facts as they exist for us, we shall find that the stable life of the dairy cow is an artificial condition. The dairyman of the future will be as far advanced as the stable will be advanced, and the stable life of the dairy cow will be the greatest strength of the dairy industry.

THIRD DAY—MORNING SESSION.

The President called upon Mr. T. B. Millar, inspector and instructor for the Association, to read his annual report.

THE INSPECTOR'S REPORT.

As Instructor and Inspector of this Association, I take a great deal of pleasure in submitting to you my third annual report.

I commenced my duties on the 17th day of April at the cheese factory known as the East and West Oxford Union, in the county of Oxford. I remained there three weeks giving instruction in the making of early spring cheese. While there a number of cheese-makers visited the factory, some remaining one day and others a longer time.

I spent one week in July with Prof. Dean at the Ontario Agricultural College Dairy doing some experimental work, and in the first part of October I spent two weeks visiting ex-students of the dairy school in connection with the Ontario Agricultural College.

During the past season I have visited seventy-eight cheese factories and one cheese and butter factory. The factories that made application and received my services are as follows :

Co. Oxford—Culloden, Brownsville, Harris Street, Thamesford, Summerville. Co. Middlesex—Burnside, West Nissouri, North Branch, Kintore, Evelyn. Co. Perth—Milverton, Cedar Grove, People's. Co. Lambton—Ridgetree. Co. Huron—Centralia. Co. Bruce—Allenford. Co. Grey—Singhampton, Flesherton, Feversham. Co. Simcoe—Avening, Stayner. Co. Dufferin—Lavender. Co. Brant—North Brant, Kelvin, Cainsville. Co. Wentworth—Woodburn, Renforth, Lynden. Co. Lincoln—Caistorville, Bismarck. Co. Haldimand—Attercliffe Station. Co. Norfolk—St. Williams, Walsh, Nixon, Lynedoch, Carholme, Vittoria, Courtland, Houghton Centre. Co. Elgin—Yarmouth Centre, Bayham, New England, Houghton, and Bayham.

In the course of my duties I travelled 6,040 miles by train and drove 1,525 miles. I tested 3,000 samples of milk with the Quevenne lactometer, and 1,215 samples with the Babcock test, making a total of 4,215 tests. 57 samples tested less than 3 per cent. butter-fat and 5 samples less than 2 per cent. butter-fat.

The poorest sample of milk that I received for inspection tested 1.5 per cent. butter-fat, and the best sample tested 7 per cent. butter-fat. (This sample that tested 7 per cent. butter-fat was a fair sample as delivered at the Attercliffe Station cheese factory, owned and managed by Mr. Harold Eagle, one of the directors of this Association. The test was made in the latter part of October. Mr. Eagle told me that the patron had ten cows and was only sending 60 lb. of milk per day.) To my mind this is a very strong argument in favor of paying for milk according to quality. Here are two patrons, one

sending milk testing 1.5 per cent. butter-fat while the milk sent by the other patron tested 7 per cent. butter-fat, and both receive the same amount of money per cwt. of milk.

During the months of May, June and July samples of milk taken from the vats tested from 3.2 per cent. to 3.6 per cent. butter-fat, then in the months of August, September and October samples taken from the vats tested from 3.4 per cent. to 4.1 per cent. butter-fat. Only a small percentage of the factories tested 4 per cent. butter-fat.

I went to the farms of forty-two patrons to get samples of milk as drawn from the cows. I laid information against thirty-five of those patrons for tampering with the milk. Thirty-three of them pleaded guilty to the charges and paid their fines, the other two were proven guilty before a Justice of the Peace. The fines ran from five to fifteen dollars and costs. Seventeen of these charges were for taking cream, fifteen for diluting with water, and three for keeping back strippings. The lowest per cent. of water added was 13 per cent. and the highest was 60 per cent. Now, for every dollar that the latter patron received for milk he was receiving for water one dollar and a half. I had evidence to prove that this patron had been tampering with the milk for at least three weeks and he was fined the sum of five dollars and costs. However, I advised the proprietor of the factory to keep back 50 per cent. of the money due this patron for one month's milk. He did so, and according to latest accounts the patron has failed to make any enquiries about it. Another patron came before a Justice of the Peace and said that he had diluted the milk with water at least three days in the week, and he was also fined the sum of five dollars and costs.

I am sorry to say that a number of our magistrates are inclined to be too easy on these cream thieves and water vendors. I believe if the fines imposed were much larger the number would be less.

There was a Babcock milk-tester in thirty-five of the factories that I visited, and fifteen of these factories were paying for milk according to quality. I believe that this is the better way. In every case where this system is adopted the cheese-makers told me, that the milk that they received during the past season had a much better flavor than formerly. This is due to the fact that the patron takes better care of the milk. The results are that this is followed by a corresponding improvement in the quality of the cheese. I would like to give you an instance that came under my own observation. In the season of 1892 I visited two cheese factories in the eastern part of my district. They were paying for milk along the old line, at so much per cwt. and received a great deal of bad flavored milk. Their cheese also had a very disagreeable flavor. During the past season I visited the same factories. In the meantime they had changed their method of paying for milk, and were paying for quality as well as quantity. Almost every patron had got an aerator and gave more attention to the care of the milk, and there was a great change for the better in the flavor of the milk delivered at those factories. When I inspected the cheese I found a vast improvement in the quality. I attribute a good deal of this improvement in the quality of the cheese to the introduction of this system of paying for milk. It also has a tendency to induce the patrons to feed their cows more liberally, give them better care, and in return they will receive larger profits.

Just here I would like to say a few words in connection with making the tests. You will all agree with me when I say that our cheese-makers have enough to do if they attend closely to the manufacture and care of their cheese, without testing milk, and while a great many of our cheese-makers are quite competent and capable of making an accurate test, yet I am sorry to say that a few are too careless and indifferent to be entrusted with such an important duty. I believe that if a number of factories (say ten or twelve) would co-operate and engage some competent person to test the milk, it would not cost as much as it does at the present time, and I am sure that it would be more satisfactory to all, and I know that cheese-makers would support a move of this kind.

I do not intend to take up the time of this Convention by giving a detailed account of our system of cheese-making. I believe that Mr. Bell has taken up something along that line, and it would be wasting time for me to repeat the old story.

I must congratulate our cheese-makers on the great victories won during the past season at the Industrial and at the World's Fair. These are victories that we are justly proud of. But do not let us be satisfied with the victories of the past. There is no such thing as standing still, and we failed to reach perfection. Let our motto be "Excelsior," and do not be satisfied with anything else. Let us work together shoulder to shoulder, and when we get another privilege to compete with the world, may every cheese score 100 and over if possible. To accomplish this we must ask the patrons to co-operate with the cheese makers and do everything in their power to send their milk to the factories in first-class condition.

There is one thing that I would emphasize strongly. That is, the great importance of having the cheese well and neatly boxed. We hear complaints from cheese buyers on every hand, and if cheese-makers and manufacturers were alive to their own interests they would not allow a cheese to leave the factory till it was boxed properly.

In December and the fore part of January I attended a number of dairy meetings in connection with cheese factories in the counties of Grey, Simcoe, Dufferin, Perth, Lincoln and Haldimand. The most of these meetings were well attended by the patrons. This to me, is an indication that the patrons are giving this branch of farming more attention, and are seeking for information so that they may make dairying a greater success in the future than it has ever been in the past. With this end in view our Association has been devising a variety of schemes whereby it might reach and impart the best possible instructions to patrons as well as cheese-makers. There are abundant evidences to prove that our efforts have not been in vain, to assist in furthering the aim of our Association. It has been the honest endeavor of your humble servant.

T. B. Millar.

Mr. D. Leitch, Strathroy: I would like to ask Mr. Millar if he was employed during the whole season.

Mr. Millar: Yes, sir.

Mr. Leitch: We wish to have your services up our way, and I got word from the Secretary of the Association that your services were valued at five dollars a day.

Mr. Millar: Five dollars a visit.

Mr. Leitch: I would like to see two instructors one in the western district and one here. We are very much neglected in our section. Our business is not thriving very well and we hardly ever see an inspector. But we thought it hardly business-like to engage Mr. Millar not knowing what his expenses would be. If Mr. Millar is to be inspector next year I would like to know what allowance is to be made him for a visit.

Mr. Millar: I could not answer that; that is a matter that is left to the Executive of the Association. I may say that I was busy all the time.

Mr. Leitch: I think we ought to have two instructors. I would furnish a Babcock tester for my factory if they knew how to use it, but I am satisfied that not one is skillful enough to use it to perfection. If we had some person to give lessons, we would have a better chance of keeping it after it was introduced. Mr. Scott, of Yarmouth, was telling me that after he had introduced the Babcock test the kickers came out to the meeting and the others stayed at home and the result was that they carried a resolution to throw the tester aside. Your hint that four or five, or say ten, cheese factories should club together and engage a competent man is a good one. It would be better than to let the cheese-maker do the work, for the cheese-maker has all he can do to attend to his own business. But if I wanted such a man I would not know where to look for him.

Mr. Scott, Yarmouth: As Mr. Leitch has brought my name before the Convention, I would like to say a few words, as otherwise a wrong impression may be left upon the minds of those present. I introduced the Babcock tester and used it during the season, and while it may be correct to say that the tester was kicked out, the explanation I have to make will show you that it was very gently done. There were not a great

many kickers. But I called my meeting very early, and just a few came out and most of them were kickers. And even though the meeting was made up of less than half my patrons there was a majority of only one against the Babcock test. I had found it a good deal of trouble, and no other factories introducing it I said I would leave the continuance of it to themselves, with the result I have stated. But I intend to call another meeting and I will guarantee that we will carry it in favor of the tester by three to one. There will be a few kickers, but very few after all. The objection of those who did object was that I did not keep the accounts in such a fashion that they could understand what they were doing. But the tester was handled correctly. When the travelling dairy was there my cheese-maker took considerable pains to understand the test. Mr. Wheaton came down and we tested it. I got the machine in April, and we experimented with samples we got from the neighbors and we had no difficulty. I am satisfied that any person that will use ordinary patience and intelligence can learn in two weeks' time, or by going to Guelph, probably in one week's time. Mr. Leitch suggests that the money spent in the Babcock test was thrown away. I would not regard it as a loss that we had made an experiment even if the test were not used further.

Mr. J. A. JAMES: In regard to this idea that we can send our young men to Guelph, it is not so. There is not room for all who apply, and I do not think we can get the information before the people except by adopting Mr. Leitch's idea and appointing another instructor.

Mr. DILLON: Something was said at a previous meeting about variations in the tests indicating perhaps, to some, that there was no means of detecting whether this variation was due to skimming or not. But if, in addition to the Babcock test, the specific gravity of the milk is taken it will be easy to detect whether the milk has been skimmed or not. As to learning the use of the Babcock test, there are still some vacancies at the Dairy School at Guelph, owing to some who had been enrolled and for whom places had been kept not being able to attend, as Prof. Dean explained. Then there are creameries in operation in this neighborhood, one of them at Mount Elgin, where the test is regularly in use. Any cheese-maker will be welcome at these places and will be taught to use the Babcock machine.

Mr. J. S. PEARCE: A few words with regard to what Mr. Leitch has said. I think every intelligent man will agree that a cheese-maker should be able to handle the Babcock test. For my part I should dispense with a man's services who could not do so. There are creameries in operation in many localities this winter. Last spring we had four classes started early before the factories opened, and cheese-makers were invited to those classes to learn to handle the test. As to the industry being backward in Mr. Leitch's locality, you all know that the Association arranged for a number of local conventions. These conventions we held in every neighborhood that wanted them. We wrote to one or two parties in the neighborhood of Strathroy about holding a convention, but no action was taken. If there is any occasion for the appointment of two inspectors the directors of the Association will be glad to employ them.

Mr. DERBYSHIRE: We have at Guelph the Dairy School, established by the Ontario Government, and there the most skilful people on the continent of America are employed in giving practical instructions not only in handling the Babcock test but also in handling every instrument used in the cheese factory, the creamery or the dairy. Everybody who intends to carry on this business ought to qualify himself by study and practice just as a lawyer or a doctor does. This school is open without money and without price.

Mr. JOHN ROBERTSON: It seemed to me that in the discussion on the Babcock test last evening some questions were raised that were not satisfactorily dealt with. Mr. Dillon has just now made a very important statement with regard to the variations shown by the test. First take the specific gravity and that will give you a pretty good indication whether it has been tampered with to any great extent. The Babcock test only shows the actual amount of fat in the milk. But if the percentage is low the Babcock test cannot tell you whether the fat never was there or whether it was there at one time and was

subsequently removed. It will do its work correctly every day in the year if it is properly handled. There was another point raised last night which was not dealt with. I met the same difficulty in this neighborhood four or five years ago, and I was greatly troubled by it. One of the cases was in Mr. James' factory at Nilestown. Suppose a man has four, five, six, seven, or eight cows and two or three of these cows happen to be running the same day. The next milk very likely would not be more than half the usual quantity and probably one third poorer than the average. The cows must be in equal condition in order to have their milk test the same. Again if you happen to get a fresh supply of acid and do not take care to have it of the same make or at least of the same quality as the other you may get wonderfully astray. I remember last summer I had to run about ten or twelve tests before I could get the proper quantity of acid to make the test correctly. But if it is handled correctly and a man understands the quantity of acid to use there will be no difficulty.

A MEMBER: But a man has got to learn that.

Mr. ROBERTSON: Just as he has got to learn to make cheese. A man must know his business. I would not want to have in a factory of mine a man who did not know how to handle the Babcock test.

TRAINING DAIRYMEN.

Hon. THOMAS BALLANTYNE: My friend here (Mr. Leitch) wants to know if the Association could not employ more instructors, dividing the territory and appointing one instructor for each section. That was done at one time, but lack of funds prevented the directors from continuing the system. The only thing I can recommend is to avail yourselves of the course in the Guelph Dairy School. It is a remarkable thing that we have not had a maker who has gone there who has not been much benefited. I know men not a hundred miles from Ingersoll who were making very ordinary goods in the fall, so ordinary that I was not a buyer. Even the best of makers will get off the track at times and nothing but a meeting with others, an exchange of opinion and watching the methods of others will help them to get back again. It is most important not only that we should have a good quality, but that the quality should be uniform. When I happened to be at Guelph last fall one of the first men I met was a man who began making cheese twenty-seven years ago and was fifteen years with me. He is one of the best makers and one of the most conscientious men I ever knew. I never knew Tom Grieve to neglect anything. Yet we found him there willing to learn. We have advocated this school at Guelph for a long time and now it is an accomplished fact. If this school does not meet the requirements, I think the best way would be for the Association to place a number of the best men we have so that each one of them in his own factory may be a centre of instruction. The instructors cannot get at all the cheese-makers. We have in Western Ontario 400 factories. Suppose you had ten instructors, see what a long time it would be before you could give all the makers the benefit of their knowledge and experience. Then in the meantime many of these makers will be making inferior goods. I made a suggestion last year with regard to early cheese which I would like to repeat. Early cheese should ripen quick; they are not made to keep; they are handled from day to day. The man in England who receives them on Saturday will drop the price on Wednesday, if he has not previously got them off his hands I would like to see a Dairy School and a good one at Guelph, but I would like something more. We ought to have a Dairy School for the west and one for the east—each run as an ordinary factory, managed by a thoroughly competent man, and one to whom cheese-makers would be ready to look for instruction. Practical experience is the true instruction. There never was a cheese-maker made at a convention, nor do we mean to say that these schools will make cheese-makers. A cheese-maker is not made in a day, and some are never made. But even the best of men can be helped, and the less skilful can be greatly helped, by the practical instruction that will be given in these schools. There is this difficulty about sending out instructors—the factoryman does not care to ask to have the instructor sent, for it may convey

to the patrons the impression that he does not know his business. It was for this reason that we combined with the business of the instructor the duty of inspecting the milk. But the cheese-maker would be willing to go to a given point for his instruction, and if that instruction is given him in an ordinary factory it will be all the more useful to him. I do not ask to have this establishment in my own neighborhood. I have never known east or west or north or south in this business. My own opinion is that Woodstock would be the proper place, for it has the best railway facilities and is easily reached from any point. If I owned the factory I would make it a condition with the cheese-maker that he should go to such a center of instruction occasionally. I have advocated this for years, but until we get it we must do the best we can. You cannot do the work so well by means of instructors. This Association was the first to introduce the system of instructers, and it has done a great deal of good, but improvement is possible. I was glad to see my friend, Senator Read. I remember when Belleville was getting a cent and a half less than we were getting in the west. They said they needed an instructor and I suggested to them a man whom I thought to be the best for their purpose. There is no reason why they should not make as fine goods as we make. There are some in Canada making inferior goods who ought to make better. We have been improving in the past and we must continue to improve.

Mr. LEITCH: I thank Mr. Ballantyne for his remarks. I have been for fifteen years in my own district trying to build up cheese-making, but I am not satisfied that we are doing as well as we ought to do. Nothing displeases me more than to find a poor quality of cheese turned out, and I would be glad to give an advance of wages to the man who could secure me a better quality. But we in the west neglect it. The people around Ingersoll think that this is the whole of Ontario, but I can tell you that between London and Windsor there are a hundred miles of territory without its equal in the Province, and between London and Sarnia sixty miles of as fine country as lies under the sun. I have been all through the States, but I am always glad to get back, for I have never seen a country that I would prefer to this. There are great possibilities in the cheese-making industry, and the result must depend upon ourselves. One difficulty is that our young men use cheese making merely as a step to something else. We are not as far advanced as other parts of the country in cheese-making, and would be glad of instruction. I would be glad if the Association could spare the money to appoint the necessary instructors, and I hope Mr. Dryden will see to it that our position is improved a little. I would make a suggestion to him that he should sell 250 acres of the Guelph farm, and try to have a little dairy school down west of London.

Mr. DERBYSHIRE: And one at Brockville, too.

Mr. LEITCH: That is just what I was about to say. We would not want more than a hundred acres, and the land could be used for carrying on a school of instruction in dairying and fruit growing. I am a fruit grower as well as a dairyman. I received from an acre of apple trees year before last $100. At present prices, if I had five acres of wheat, I could not get what that crop of apples brought me.

Hon. Mr. READ: You would be in debt if you raised five acres of wheat at present prices.

Mr. LEITCH: The mistake the farmers make in fruit growing is that they plant half a dozen varieties But a great deal could be done in both dairying and fruit growing if we had a school of instruction for the western section and one for the east.

The CHAIRMAN called upon Prof. Fletcher, Dominion Entomologist, for an address.

INSECT PESTS.

Mr. FLETCHER said: I am going to speak to you to-day upon what I know to be one of the most important subjects of your dairy industry. I refer to these little creatures which in this country are usually called "bugs." (Laughter.) Ah! Mr. President, I see, as I quite expected, the audience receives this statement with laughter.

Farmers have been practically laughing at and treating with neglect this subject of injurious insects for many years; and, as a consequence, their crops and incomes have been enormously reduced year after year. During the past season one insect alone, the well-known horn-fly, has reduced the supply of milk sent to the cheese factories in Ontario and Quebec, from one quarter to a half of what it ought to have been, and would have been but for the occurrence of this new and troublesome cattle pest. The Hon. Mr. Ballantyne a few minutes ago, when speaking of the great care necessary in training dairymen and others before they could do good, effective work, said that attending meetings could not make practical men; but careful study and training, extending over some time, were indispensable. This is true, but I maintain that there are so many incidental advantages, and so much unexpected information is given at such meetings, that I attach the greatest importance to them, and I find always that it is the best and most progressive farmers who attend. My own trouble at such meetings is that there is so much new to me and of value at each meeting that I cannot remember it all, and I have adopted the following plan, which I recommend to you. In the first place, I never attend a meeting without a pencil and note book; and I do not attempt to remember everything, but I take a note of anything that seems to me will be of value in my work. I listen to everything, and try to take away with me one new idea. I have found that, if you make voluminous notes so as to try to remember everything, you are apt to put them by and never look at them again. After having made a note, if later in the meeting something strikes me as more important, I rule out the first note and write down the new point. I have found, to my own satisfaction at any rate, that I can learn more by being content to take and do one thing at a time; and, after all, there is nothing very new about this, although it is unfortunately seldom practised.

In all work, those who attain to the greatest success are those who are most in earnest. This same idea is brought out in people being proud of, and sticking up for, their own country, town or district; and this has been well brought out to-day; it is, of course, a most pleasing feature for an outsider to notice. I knew before I came to Ingersoll that good cheese was made here, that the farmers were progressive, that the land was good, and that everything was prosperous. I did not, however, know that they were the best in the world; but, during the last two days, I have discovered that I have at last struck the hub of the universe. (Laughter.) I believe that, to be successful, every man should take such an interest in his work as to believe that there is nothing more important. We have heard several eloquent speakers during this Convention, telling us how they, by skill and good management, have secured good results in the various branches of farming and dairying; and each speaker has shown plainly that he thought his work of momentous interest. It is now my turn, and, before starting, I have the advantage of not only thinking, but knowing, that there is nothing at all in all of your operations which can compare with the objects of my studies for affecting the state of your pockets and bank accounts, and, therefore, I submit, which are of so much interest to you and your families, and also to the country at large.

My business at Ottawa is studying the injurious insects, fungous diseases and noxious weeds, which cause so large a diminution in your crops every year. These pests are the cause of an annual loss of no less than 20 per cent., which means that your incomes are reduced every year nearly one quarter below what they ought to be, and this almost without a grumble, or even, for the most part, without an effort to prevent it. This should not be the case; for of about 100 different kinds of the most injurious insects, which number will certainly cover the most frequently occuring attacks upon crops by insects, a sufficient amount of knowledge has been accumulated to give information which will enable farmers to avoid a large proportion of this loss. Not only is this the case with insect enemies, but it applies equally to fungous diseases of crops. Remarkable instances are the good results which have attended the spraying of apple trees to prevent the "black spot" of the apple, and potatoes to protect them from the potato rot. The mixture which has given the best results for this purpose is known as the modified Bordeaux mixture, and consists of copper sulphate, 6 pounds; freshly slaked lime, 4 pounds; water, 45 gallons. A great convenience with this mixture is the fact that Paris green, which should be used for certain insect

enemies at the same time, may be applied in the one spraying, with almost equally good results. The usual strength recommended for Paris green, when used either upon apple trees or potatoes, is 1 pound in 200 gallons of water; and it may be added to the Bordeaux mixture in the same proportion. In treating fungous diseases, too much stress cannot be laid on beginning the spraying early; the black spot of the apple passes the winter on the twigs in a dormant state, and if the trees are thoroughly sprayed early in the season, the disease is very much reduced. There should be another spraying soon after the flowers drop, and another one a fortnight later. For the potato rot, the first spraying should not be later than the 21st of June, and there should be three other applications later, two or three weeks apart. If Paris green is added, the codling moth will be kept in check on the apples, and the Colorado potato beetle on the potatoes.

Farmers lose much from the attacks of insects in every branch of their industry, but the more the lives and habits of insects are understood, by so much will it be possible to avoid this loss. The study of insects is called Entomology. Insect is a Latin word, meaning that these animals have their bodies insected or cut into. Entomology is almost the same word, but in Greek instead of Latin. I merely refer to this because of the long name which is attached to my office of Entomologist. Many think that injurious insects are on the increase. This is probably owing to the fact that during the last ten years much closer attention has been directed to the subject; but, at the same time, the great increase in the area under cultivation, and particularly large fields of one kind of crop, have undoubtedly furnished the conditions essential to the extensive multiplication of the special pests of each crop. Insects are, as a rule, particular as to their food, and it is a rare thing to find a species which will feed upon plants belonging to several families. In studying the life histories of insects, we find that allied species generally feed upon plants which are also allied to each other. The apple curculio in nature feeds upon the fruit of the hawthorn, which is closely allied botanically with the apple. Again, the Colorado potato beetle in a state of nature feeds upon a prickly *Solanum* found in the mountains of Colorado. This is related to the cultivated potato, but is a rare plant, and, consequently, the potato beetle was also very rare in a state of nature. When, however, by the westward extension of civilization, the potato plant was also carried westward, and its cultivation reached the native haunts of the beetle, it provided all that was necessary to make a rare insect an aggressively common one, namely, a large food supply. During the past year an insect has been observed in the North-west Territories feeding upon a wild member of the Spinach family. Its life-history has been worked out, because we may anticipate that, as soon as other members of the Spinach family, such as mangels and beetroots, are grown in that district, they may be attacked. This indirectly points to the importance of keeping down weeds, so that the insects which feed upon them may not spread to crops of plants allied to the weeds.

The importance of a sufficient supply of proper food for all animals is self-evident. We have heard during the meeting how the quality and quantity of milk fell during last summer in some districts. I think this was due chiefly to the attacks of the horn fly; but it was undoubtedly also due to the short supply of succulent grass and fodder owing to the exceptional drought.

It may be well to repeat what is probably well known to most of you that insects do not come into existence spontaneously, but all are reproduced like the larger and higher animals, from a male and a female parent similar to themselves. All insects pass through four stages, the egg, the grub, the chrysalis and the fully developed insect. Again all insects may be divided into two large classes according to the nature of their mouth parts. One of these classes takes its food in a liquid condition through a hollow sucking tube. The other class have jaws, by means of which they bite off the substance of their food. For this latter class, all that is necessary as a remedy, is to place upon the surface of their food some poison which, being eaten with it, will destroy the insects. Such poison we have in a convenient form in the arsenical compound known as Paris green, which can be used with such good effect in spraying apple and plum trees against their worst enemies, the codling moth and curculio. For the former class, the sucking insects, of which we have a good example in the horn-fly, which has done so much injury among your herds during

the past summer. These poisons would have no effect, because they would thrust their beak through any material on the surface of the animal attacked and suck its blood from beneath. For this class, remedies which kill by mere contact with the bodies of the insects, must be used. Such remedies we have in insect powder and kerosene emulsion. The effect of the first upon insects is very remarkable, and it is supposed to suffocate the insects by paralysing the muscles and nerves which control their spiracles or breathing pores. The kerosene emulsion also suffocates them from its oiliness, as a small quantity placed on an insect soon runs over its body and stops up the small breathing pores.

Remedies for insects are either *active* or *preventive*. (1) Active remedies consist chiefly of the different methods which come under the head of hand-picking and use of poisons. In hand-picking is included the use of such apparatus as the hopper dozers, now so largely used in some of the Western States for the destruction of grasshoppers. (2) Preventive remedies are either agricultural or deterrent. The latter of these consist chiefly of the use of special apparatus or applications such as alkaline washes put on trees to prevent borers, or mechanical contrivances placed round the trunks of trees, to prevent canker-worms or other crawling insects from climbing up to destroy the leaves. Agricultural preventive remedies come under the following heads: (a) High culture, by which a vigorous, healthy growth is induced, which enables the plants to resist or outgrow the attacks of their enemies. (b) Clean farming, by which all weeds are kept down. Weeds are frequently attractive to such insects as cut-worms, the moths of which lay their eggs on them, where they have been left to grow rank in the autumn; and then the following spring, the farmer who had allowed his fields to be dirty in the autumn, will lose his crop from the ravages of the cut-worms. (c) Early or late seeding, by which crops are exposed to the attacks of their enemies at a time when they are best able to withstand or outgrow the injury. This is useful for such insects as the turnip flea. It has been found at Ottawa that turnips sown between the 15th and 20th of June came up after the first brood had disappeared and are as a rule sufficiently far advanced before the second brood appears to be beyond injury. (d) Rotation of crops. Too much importance cannot be laid upon the value of a proper rotation of crops; for, not only is it of great advantage in the proper utilization of the various elements applied in the fertilizers, but insects of any given crop will soon increase beyond control if the same plant is grown continuously on the same land.

Grass insects frequently increase from a disregard of this latter fact. It is remarkable how largely a grass crop may be reduced by insects without its being noticed, as the crop is standing in the field; and it is only when the crop is harvested that the shortage appears. There are numerous small insects known as leaf hoppers, which live in countless numbers in old pastures, and do much injury. In addition to these, many kinds of grasshoppers occasionally appear in large numbers, as during the past season. These exceptional occurrences also are usually in seasons of drought, when the plants are least able to recuperate. The grasshoppers which did so much harm in certain districts of Ontario during the past season, were chiefly the common red-legged locust; this insect passes the winter as an egg, beneath the surface of the soil. They hatch in May, and before the beginning of July when they become fully developed. Locusts pass through seven stages, the egg, two larval stages, three pupal and the perfect form. In the larval stages there is no appearance of wings. After the second moult, however, small wing-pads appear, which increase gradually during the succeeding stages. When the last moult takes place, from these short wing-pads, large gauzy wings are unfolded. In a few hours these harden, and the locust is now full grown and can fly with ease from place to place on its mission of destruction.

A VOICE: Where do they use hopper-dozers?

Mr. FLETCHER: In the north-western States of Minnesota and North Dakota. They have been used with great effect during the last four or five years. The injury from locusts was so great that the Government of the State provided the sheet iron necessary for making the machines and the coal oil or tar for placing in them to kill the insects. Plowing in the autumn to destroy the eggs was also made compulsory.

Prof. Osborn, of Iowa, has shown that by treating pastures with one of these machines from early in the season until the grass was too long, a saving of no less than 35 per cent.

was made. Should grasshoppers show themselves in large numbers next spring, I believe it will pay farmers in Ontario to find out about these implements and use them.

Mr. D. Leitch: I lost $50 last year from grasshoppers in my clover.

A Voice: We lost hundreds.

Mr. Fletcher: Yes, I know. The loss was very great in Western Ontario, especially in those districts where the dry weather prevailed.

Mr. Beam: Are not insects worst in old pastures?

Mr. Fletcher: Yes, undoubtedly. That is why I have drawn the attention to the value of rotation of crops. Reverting to active remedies, I take this opportunity of saying that I believe Paris green is the only practical remedy for potato bugs.

A Voice: How would you apply it to potatoes:

Mr. Fletcher: For my own part, I prefer to apply all of these poisons in liquid form, that is, mixed with water; one pound in 200 gallons of water is strong enough when the grubs are young; but as the potato is not a plant easily injured, one pound in 100 gallons may be used. When Paris green is applied in a dry mixture, by diluting it with dust, flour, lime or land plaster, it is apt to be blown about and gets into the mouth and up the nose of the operator, and there is also the danger of it being blown on to adjoining crops. The easiest way, undoubtedly, is to apply it with a spray pump; and now that the utility of the Bordeaux mixture for the prevention of the potato rot is becoming so well known, I have no doubt that this will be the method most largely adopted in the future.

A Voice: Does that mixture injure the leaves?

Mr. Fletcher: I never knew it to do so, even when put on the plants of the full strength, which was 6 pounds of copper sulphate, 4 pounds of fresh lime, and 22 gallons of water. The mixture as I now recommend it for potato rot is made as above, but with 45 gallons of water, and half a pound Paris green. Thus, at the same operation, we treat both the potato rot and the potato beetle.

A Voice: I like the dry mixture best, and find it does not blow, if applied when there is dew on the plants.

Mr. Fletcher: This is very true; but it frequently happens in May and June that we have nights without any dew. Dew is only deposited on clear, bright nights.

A Voice: Would you put Paris green on turnips for grasshoppers?

Mr. Fletcher: It might be tried on small areas, but it is very difficult to treat these insects after their wings are developed. They should be watched for in May and June, and if they appear abundantly in the pastures, where chiefly they breed, the hopper dozers should be used. Much good would result if farmers would make a practice of cutting hay earlier than is now often done. This would be better for the hay, which is as a rule cut much too late, and would also expose the young grasshoppers before they were large enough to bear the heat of the sun, and would besides starve myriads of them by depriving them of their food supply at a time when they could only hop and crawl a short distance.

A Voice: If Paris green is liberally applied to potato fields, will it not affect the soil injuriously?

Mr. Fletcher: No, sir.

A Voice: Is there any danger in spraying trees in a field where calves are to be pastured.

Mr. Fletcher: There is very little danger if proper care is taken. The quantity used is so very small, 1 pound in 200 gallons being the strongest mixture recommended, and this quantity would be sufficient to spray from 75 to 100 trees. If a week or ten days were allowed to elapse between the time of spraying and the turning in of the calves, there would, I believe, be no danger. Prof. Cook, of Michigan tried experiments to test this, and was so convinced that there was no danger that he turned a favorite horse into an orchard immediately after spraying, and there were no ill results.

Fruit trees should not be sprayed while in blossom, as there is a possibility that bees might be poisoned. I am not prepared to say whether or not this actually is the case, but at any rate there is no advantage in the practice. Apple trees are sprayed to protect them from the ravages of leaf-eating caterpillars, or the fruit from the codling moth. For the latter all that is necessary is to spray the trees after the petals of the flowers have fallen, and leaf-feeding caterpillars may be sprayed at any time they are observed on the trees. If apple trees are sprayed when in flower, besides running the risk of poisoning bees, there is also the danger of corroding the delicate surface of the stigna, so that it cannot be fertilized by the pollen.

A Voice: Is there not a law against spraying on account of the bees?

Mr. Fletcher: No. The law is against spraying at the wrong time, namely, when the trees are in flower.

A Voice: How strong should the mixture be, and how often applied?

Mr. Fletcher: For apple trees, 1 pound Paris green, 1 pound fresh lime, 200 gallons water. Make first application as soon as the flowers drop, and follow with two others a fortnight apart.

A Voice: What is the best pump for spraying a small area of potatoes?

Mr. Fletcher: One of the forms of knapsack pumps would probably be found the most convenient. These consist of a reservior holding from 4 to 6 gallons, which is attached to the back by straps, the liquid is forced out of the nozzle by a small force pump soldered on to the reservoir. For a larger area than three acres, a pump drawn by a horse would be necessary. A very good one I have used during the past summer is made by Mr. Van Duzer, of Grimbsy. The prices for such pumps can be found in most of the seedsmen catalogues. I believe Mr. Pearce, who is present, is getting up a new improved pump.

Mr. Derbyshire: We have a good one made in Brockville.

A Voice: Last year I got a pump, cost $12; I tried it, but gave it up as I found an ordinary watering pot more convenient.

Mr. Fletcher: Of course, pumps vary very much, but those I have found decidedly more convenient for applying these mixtures than a watering pot.

A Voice: We find that Paris green varies very much in strength.

Mr. Fletcher: I am of the opinion that the supposed variation in the strength of Paris green is more imaginary than real; but for the comfort of those who believe that it is greatly adulterated, I will say that the question of the adulteration of Paris green is now being considered by the Government with the idea of so changing the law that only pure Paris green will be allowed to be sold as such.

But, Mr. President, although I am extremely pleased at the interest which has been shown in the subject of my address by the number of questions which have been asked by the audience, I have not yet got to the question that I wanted particularly to bring before you, namely the horn-fly, and its treatment, and yet I fear that the time at my disposal must be nearly exhausted. (Cries of "Go on, Go on"). You will all agree that the horn-fly has been the cause of much loss during the past season, but yet I have been informed by almost all the cheese-makers I have met, that very little has been done systematically by farmers to save this loss. In the discussion yesterday, Mr. Gould asked me if it was not the case that the horn fly was less abundant now in some districts, where it was formerly extremely numerous, and whether it was not likely that it would also decrease in numbers here. I had to acknowledge that this was the case, but I did not want to let you know about it just yet, because if you get this idea into your heads you will still continue in the neglect of simple and cheap means by which you could prevent much of this loss.

The horn-fly is a new insect, which was introduced into the Eastern States five or six years ago. This is only the second year since it first appeared in Canada, but it has increased and spread so quickly that it has produced great consternation among cattle owners. The frequent assertion that the flies or the maggots have caused the death of

cattle by boring into the horns, head or body, is entirely inaccurate: the whole injury is due to the bites of the fly; however, the irritation from this cause is in many cases so great that animals fall off rapidly both in flesh and yield of milk.

The life history is briefly as follows: The mature flies appear early in spring and lay their eggs upon the fresh droppings of cattle. These soon hatch, and the maggots live in the dung while it is in a moist condition. They then turn to the pupa state, and the flies again appear within two or three weeks from the time the eggs were laid. There can thus be several broods in a season.

Almost any greasy substance rubbed on the animals will keep the flies away for several days. A number of experiments were tried on the field, with the result that train-oil alone and train-oil or lard with a little sulphur, oil of tar or carbolic acid added, will keep the flies away for from five to six days, while, with a small proportion of carbolic acid, it will have a healing effect upon any sores which may have formed. Axle-grease, tallow, and any such greasy substance can be used to advantage, but train oil or fish-oil seem to be more lasting in their effects than any others experimented with.

An effective and undoubtedly the easiest remedy to apply, if a small spray pump be used, is the kerosene emulsion, which consists of the following: Kerosene (coal oil), 2 quarts; rain water, 1 quart; common hard soap, 2 oz. Boil the soap in the water till all is dissolved; then, while boiling hot, turn it into the coal oil, and churn it constantly and forcibly with a syringe or force pump for five minutes, when it will be of a smooth creamy nature. If the emulsion be perfect, it will adhere to the surface of glass without oiliness. As it cools, it thickens into a jelly-like mass. This gives the stock emulsion, which must be diluted before using with nine times its measure, that is, twenty-seven quarts of water. It will be found to mix much more easily if done at once, before it cools. The above proportions give three quarts of the stock emulsion, which, with twenty-seven quarts of water added, make up thirty quarts of the mixture ready for use. This may be applied to the animals either by means of a sponge, or, what will certainly be found most convenient where there are many animals to treat, by means of a force pump and spray nozzle. The emulsion thus made and sprayed over the cattle kills all the flies it reaches, and if repeated twice a week will almost entirely relieve cattle from annoyance. Another method of diluting the coal oil is to make the emulsion with milk instead of soap and water. Take sour milk, one part; coal oil, two parts. Mix the two thoroughly, as described above for the soap emulsion. Then dilute with water, so that one part in ten will be coal oil.

A good way to fight this pest will doubtless be to prevent it from breeding and increasing. As stated above, the maggots can live only in the moist droppings of cattle. Any means, therefore, which will insure the drying up of these before they are full grown will destroy them. This can be done most easily by spreading the dung out in the pastures regularly and at short intervals. Twice a week would be sufficient, and it would be equally effective in wet weather, when the substance would be washed away, as in hot weather, when it would be dried up.

A Voice: How long will the kerosene emulsion keep the flies away?

Mr. Fletcher: Two days at any rate, and longer after a few applications. I believe it will pay farmers very well to follow my advice in this matter, even if they have to treat their animals every day. The kerosene emulsion, diluted as I advise, costs less than a cent a gallon; and the saving will be many cents a day, to say nothing of the comfort of the animals.

A Voice: What about carbolic acid?

Mr. Fletcher: I like carbolic acid as a remedy. Farmers will always use it. It is a good remedy, but it will not mix easily with water and is apt to burn the skin. What we want is something greasy, and the cheapest greasy substance is tanner's oil. Mix carbolic acid with it and you have an excellent remedy, which is to be rubbed in the hair of the animals. This is tedious; but this is an exceptional visitation, and we must take exceptional means of combating it. The great question is: "Does it pay?" I say it does.

A VOICE: Does that kill the flies?

Mr. FLETCHER: No; but it prevents them from settling on the cattle.

A VOICE: Does not the emulsion taint the milk?

Mr. FLETCHER: No; I have never had any trouble of that kind.

A VOICE: Does insect powder kill the flies?

Mr. FLETCHER: Yes, it would kill them; but the powder is too expensive to be used with advantage.

A VOICE: Will spraying keep the flies off the bellies of cows?

Mr. FLETCHER: Yes; we found it worked quite well.

A VOICE: Are we not just on the eve of the invention of a trap to catch the fly?

Mr. FLETCHER: There is one already invented. It is based on a theory that the fly does not fly far, but this is erroneous. The fly has spread all over Ontario and Quebec in a year.

A VOICE: Why not spray the cows in the stable?

Mr. FLETCHER: It would be easier to spray outside; but it would answer in a stable after milking, and the smell of kerosene would keep the flies out of the stable.

Hon. Mr. READ: As this is an experience meeting, and as I have had in the course of my work in cattle feeding some experience with insects, I would like to mention a point or two. I had a heifer that seemed to breed black lice. I did everything I could to get rid of the pests—kept her away from the rest of the herd, used quassia and all sorts of things. Then I sent her, with fourteen others, to a farmer who I thought had more time to give to her than I had, and agreed to pay him. The man had her for two years, but last fall he sent her back and said that though he had tried everything he knew he had not been successful in ridding her of the lice. I determined that the vermin must go. I put her apart from the rest of the herd, bought a ten cent curry-comb and used it. The lice are gone. I do not understand exactly why. Before using the curry-comb I had a man take her out and they made a decoction of soap suds—I don't know whether there was any oil in it or not—and then, with a heavy scrubbing brush, they gave her a good scrubbing.

ADDRESS BY THE MINISTER OF AGRICULTURE.

Hon. JOHN DRYDEN, Minister of Agriculture for Ontario, was then called upon, and said: The first thing I want to say is that this is certainly a grand meeting. I am delighted to be here, and all present, whether dairymen or not, must be pleased to find such a gathering as this. I am especially pleased to know that there are several prominent American gentlemen here. I am glad to have had the opportunity of looking into their faces and I am glad to be able to tell them that this audience is a fair sample of what you find all over the Province of Ontario. I hear everywhere I go about this, that or the other place being a garden of Ontario. From this fact our American friends may know that this special district is not an exception to the rule, but that wherever you go you find the people equally enthusiastic about their own district. I am always glad to mingle in convention with our dairymen, for the reason that they are among the most intelligent, the most progressive and the most enterprising of our agriculturists, as well as for the further reason that they represent associations in this Province that have done more in recent years towards perfecting the product in which they are interested than any other of our organizations, and thus have done more than any other to add to the wealth of the country. There is still another reason why I am glad to be here on this occasion, and that is because the dairymen have so lately come back from the splendid victories they achieved in competition with all creation at the World's Fair, and I know, therefore, that the dairymen here will be in the very best of humor. I have been looking over the record you made at Chicago, and I observe that there is a small margin for improvement still

left. Out of a possible 100 points you have scored 96 in many cases and in many others 98, which must be considered a very good record, but when it comes to 99 and even 99½, there is not a great deal of room for improvement. I hope that this missing half point will be sufficient to give our men inspiration in the future, so that their motto may still be "Forward." Another thing that makes me glad to be here is that this town of Ingersoll is, in respect to dairying, historic ground Here the first dairyman's association in Ontario was organized, and here, I believe, the first annual convention of dairymen was assembled. Here, also, I observe on looking over your programme, the first cheese fair was held under the auspices of this Association, and here, I think I am right in saying, there has been established one of the best of our regular cheese markets, so that the "Ingersoll" brand is a sufficient guarantee of quality to command the highest price.

Mr. DERBYSHIRE: And Brockville, also.

Hon. Mr. DRYDEN: No, I am not referring to Brockville just now. My friend Mr. Derbyshire, is not satisfied if anything is said and Brockville not referred to. Brockville is all right. Twenty-five years of earnest, unceasing work has brought to the dairymen of Ontario their deserved reward, and you have now the satisfaction of knowing that your product occupies the first place in the markets of the world. Those who have managed this Association during those years have not been believers in coercion in legislative enactments to compel people to do certain things, but rather believers in the better method (in my judgment) of educated work of spreading instruction and information, so as to enable the cheese-maker and the patron to do the very best work possible under the circumstances. You have picked out your best and strongest men and have sent them out to help those who were weaker. The dairymen of this country have been standing shoulder to shoulder, realizing that their interests were identical, knowing that one man could not make a poor article and put it on the market without injuring all the others. You have been striving for a uniform product, with what result let the record in Chicago and in the markets of the world answer. I may take the opportunity to congratulate the Association upon the progress that has been made, and I think it may be proper to say that the whole Province of Ontario, in every branch of industry, is indebted to the enterprise and energy of our dairymen for what has been accomplished through this organization. This Association can show tangible results for the public money which has been expended in its behalf, and in this regard it takes the lead and sets an example to all our other associations. No matter what the association may be that receives public money, the people, to whom that money belongs, have a right to know what they are getting for their expenditure. Some of the associations seem to be affected with black knot or something of that kind, which dries them up, so that they do not do what the public have a right to demand. That can not be said with reference to this Association, for it has always been wide awake, and it has always done good work, the results of which none can fail to see. I hope I may venture to express the hope that the past success of your work and your present attainments may not lead to stagnation, for that is a natural process which must be guarded against. You must remember that by going to Chicago you have given away these secrets of your success in the world's markets, while, at the same time, convincing the world that you are entitled to the first place. While you have been sending abroad from year to year the best product, others have been looking on and have been learning by your example. You will have to meet these people in the future, therefore our interest must not be relaxed; we must still press forward; we must do better in the future even than we have done in the past. The success which you have attained is due to the skill and accuracy with which our cheese-makers have been doing their work. But I have in mind another class to whom also praise is due, the men and women who, by their persistent, constant, intelligent and careful work, provide the material, which, under skilful hands, appear in the market as the very finest product. While that is the case, I think the work to be undertaken in the future is to give to these people such instruction and information as will enable them, with the same labor, to produce a still greater quantity and even better quality of the material you have been using. While speaking upon this point, let me say that I cannot commend too highly the action of this Association in spreading their efforts over a larger district than

is usually covered by the holding of your annual convention. I understand that the Association held last year a large number of meetings in the various districts, and that this policy will be continued during the present year. It is a most desirable thing for this Association to endeavor to bring together the farmers who are supplying the raw material for this industry, so that they may discuss the best methods, and so that experienced, practical, successful men may tell others what they have accomplished and how they have accomplished it. There is no doubt that the cheese-maker and the man who owns the factory are perfectly helpless unless they can have the co-operation of those who furnish the milk to the factory, and there is no doubt the farmers are helpless unless the material they furnish is worked up by a skilful man. The interests of the two are the same, and each class is interested in the other. The other day at one of the Associations—I think the Creameries' Association—a Mr. Whitton was asked to give his experience in this matter. He is one of those men who keep accurate accounts, so he is able to give in dollars and cents the results of his work. He did not have a very large herd, his barn containing eight cows one year and ten cows the next. Commencing the first of April, 1892, and ending the 31st of March, 1893, he showed a return from these eight cows of $853, or something over $100 for each cow. He made it up in the following items:

Cash received from the cheese factory	$505
Value of calves and whey	80
Cash received for butter during the winter months derived from the milk taken to the creamery	193
Skim-milk	75
Total	$853

He charged the cost of feeding these animals at $294, which, you will see, leaves a profit of $559, or within one dollar of $70 per cow. That may seem like a slightly exaggerated statement, but I do not doubt that it was perfectly accurate; I have heard of others who have had a similar experience. I admit that this is not the average experience and that we have a good deal to learn which will bring profit to the people who are supplying milk to the factories. Now, what one man does another man can do under similar circumstances. We hear people say sometimes: "That is well enough for so and so but his case is not my case." They tell me: "That is well enough for you, Dryden; you can do it but I can't." I do not believe in that sort of talk. What one man has accomplished, I with the same skill and care can accomplish. There is no magic in it; the same results can be attained by adopting similar methods. Mr. Whitton when he rose to make some explanations told the people there was nothing wonderful about his cows; they had no very long pedigrees but good ordinary cows selected for the purpose for which he was using them. But Mr. Whitton did not turn these cows into a pasture field, and if they could not find there what they needed, satisfy himself with the excuse that the season had been very unfavorable. Nor did he turn them out in the yard in the winter time to shiver in the cold. He provided them proper food at all seasons of the year.

Hon. Mr. Read: Mr. Whitton is a cheese instructor; he is away from home nearly all the summer, and it is his wife who looks after these matters. (Laughter and applause.)

Hon. Mr. Dryden: I am very glad Senator Read has given me that information. The wife is the better half of a man, we all know, applause) and where work is hers she is certainly entitled to the credit. In order to show you that there is nothing phenomenal in this, let me for a moment draw your attention to some returns received by the Bureau of Industries from 100 of the factories for the past season. We chose 40 factories in the west and 60 in the east, and the figures I am to read you are compiled from the returns received from these factories. These figures show that there was a great falling off in the supply during some of the months when ordinarily such would not be expected. For instance take the month of June. Forty factories gave a total return of twelve and a quarter million pounds. In August this was reduced by four million pounds. The same is true of the factories in the east. The sixty factories in June received nearly eighteen millions of pounds and in August only twelve millions. Of course we cannot

expect as large a supply in August as in June, but this is too great a reduction. Men like Mr. Whitton will not show you such results. What was the reason for this falling off? Undoubtedly it was the tremendous drouth which affected the whole Province, but more especially the western section. Mr. Gould has told us of his friend whose cows never knew there was a drought. That is what is wanted; we must make provision for such unfavorable season. The dairyman more than any other farmer can provide for these special circumstances. There is no doubt he has his business more directly under control than any others of us. The man growing a crop of grain may work hard and exercise the grestest skill and bring his crop nearly to the point of perfection only to have it swept away by a storm. But the dairyman is not thus affected, and our people ought to be taught how to provide in advance for difficulties which may arise. It is for this reason that I commend the work of the Association in holding meetings over the entire district to awaken greater interest in the work and to give the necessary instruction. Last year, when I met this Convention in London I took occasion to express pleasure at the privilege I had of scattering the Dairymen's Report all over the country. I told you how valuable a report it was. I desire to repeat that statement and to tell this Convention that my Department receives constantly evidence of the value of the work which includes the report of the Eastern and Western Dairymen's Associations and the Creameries' Association. This report ought to be read by thousands more of our people. I should be delighted to give it to them, but we send it only to those with whom we have some direct means of communication. I do not want it thrown around on platforms as we see the literature at some of our farmers' institutes. People seeing literature in that way are apt to come to the conclusion that it is not worth much. There never was a time in the history of the Province when dairying was regarded as so important, when there was so much interest and enthusiasm aroused concerning it, and when it wa necessary to do so much in order to meet the wishes of the people with regard to i It has been suggested that, as head of the Department of Agriculture for the Province, I ought to do more than I am doing, and my friend Mr. Leitch has told me how I ought to do it. I am delighted to hear his suggestion. So long as I am there you may count upon having a friend if you belong to the Dairymen's Association or to any other association seeking to promote the interests of agriculture in this Province. I shall always be glad to do what I can. When I come before my constituents and I am met by my opponents with the argument that I am increasing the expenditure of the Province and therefore should be put out of office, I do not make any apology nor do I want anybody else to make any apology on my behalf for spending money on these associations. I am not ashamed of it, I am proud I have done it. And why? Simply because I have been expending this money on business principles, precisely the same as I expend money on my own farm. I have been twenty-five years spending money in thoroughly draining my farm. I have put lots of money under the ground. People who come to see me sometimes say: If I had a farm like this I would have a chance to make money. Did I put the money under ground to hide it away? Not at all, but because I knew I should get it back again. I am investing the money of my Department on the same principle in the intersts of the Province, and I can convince any fair minded man that the money I have spent for the dairying industry had brought back abundant returns. I am sure that the Legislatnre and whoever happens to be in my place in the future cannot do better than spend some of the money of the Province in encouraging and assisting this great industry. Though we are living in days of depression and failure, we find the results of dairying even better to day than they were years ago. Though we have increased the butter product and the cheese product year by year the average price we are receiving to-day is more than we have ever received. So we have every reason to go on with this great industry. And I can only say in conclusion that this Association cannot do better in accepting the grant made to it by the Ontario Legislature than to continue in office such men as your President and such men as have always been at the head of this Association, men who do not so administer your affairs as to fritter away the money but use it to the best advantage in helping our dairymen all over the Province.

The PRESIDENT: The presence of Hon. John Dryden proves to us that there is no position to which a farmer may not aspire, and his speech is proof that the proper person to have at the head of an Agricultural Department is a practical man—a farmer. While some of us hope that he may long retain the place which he now so ably fills we all know that there are other farmers who, in case of a change of government could fill that position with credit to themselves and with advantage to the province, as Mr. Dryden has done.

MR. GOULD ANSWERS QUESTIONS.

A MEMBER: I would like to ask Mr. Gould how he cares for cows that calve in the winter.

Mr. GOULD: A very important question. In the first place you must remember that a cow has had a home life, and if at the time when she is to calve she is taken away somewhere else she gets homesick. If a cow should happen to calve in the winter she does not feel at home if you take her away from the rest of the cattle. When our new barn was built, in the south west corner, the sunniest and warmest point there is a ten foot square stable built for a nursery. We keep pretty close watch upon things and four or five days before the event is expected to occur she is transferred to this stall where she can see the rest of the cows and have all the society she wants. As soon as she has dropped her calf and before the calf has a chance to get up on its feet and suck, we simply tie a rope around his neck and place him where the cow can do the mothering, but we prefer to do the milking of the cow ourselves. You know the calf has a wonderful way of twisting his tail until he gets himself wound up and then—a bunt. The cow trying to prevent a repetition of this may hurt the little calf. Shut off the cold water. Every hour and a half take a pail of water at 75 or 80 degrees and put in bran and fine middlings and a handful of warm meal and give her that. Bring a tea kettle of water from the house and don't give the cow all the cold water she will drink until 36 hours after the calf is born, then let her drink. Most people say it is going to be a terrible job to get the calf to drink. If you let him suck before you teach him to drink you are going to let him have a pic-nic; you will have to straddle him in the old fashioned way and push his nose down—at which point something usually happens.

A MEMBER: Do you allow a cow to eat the placenta?

Mr. GOULD: Well sometimes she gets the advantage of us, and I do not say I know about this thing, but we do not favor it. If the calf is born in the night time sometimes the placenta disappears. They tell us that away back in the earlier period of the cow's evolution the cow ate the placenta so as to hide her trail from wild beasts.

A MEMBER: How about caked bag?

Mr. GOULD: We found out one thing and that is that if cows are kept in the stable caked bag disappears. Some seem to think that the cow needs to be turned out for exercise. But if you turn her out in the cold she takes exercise by standing around in the fence corners and lying down in the snow so that you will have caked bags all the time. But we did have a case of caked bag once. We used hot water and a little ammonia and the caked bag disappeared. Having washed the bag with a little ammonia, dry it as dry as you can and put on lard; put it on thick. Keep the air away from the pores of the skin and the swelling will disappear within 24 hours.

Hon. Mr. READ: Tie her in the horse stable and if she does not get well without any other attention write to me.

The meeting adjourned until the afternoon.

THIRD DAY—AFTERNOON SESSION.

The meeting assembled first in the Select Knights' hall, but that having been found not sufficiently commodious for the great attendance the meeting adjourned to the Salvation Army barracks. The town hall had to be given up because of the preparation necessary for the evening banquet.

SOME BRIEF BUT TIMELY SPEECHES.

Mr. DERBYSHIRE was called upon to address the meeting. Owing to the confusion attendant upon the hasty change of meeting place he was but imperfectly heard. He spoke in effect as follows: We are having a glorious time in Ingersoll, the original home of the modern dairy, as our President has told you. We are proud of the progress that has been made in this great industry, but what has been done is enough to make us expect far more in the future. The people we have at this meeting must convince anybody that we have the people to carry on this industry. We have had meetings to crowd the largest hall in town and we have speakers enough to entertain and instruct three meetings. The addresses that you have heard must have convinced you of this. It only remains now to put in practice what you have learned so as to produce the largest quantity and the best quality of milk with the least expenditure of labor and money. If you will put in practice the best methods this country can produce twice the quantity of milk it now produces at one half the cost. The general adoption of the winter dairying system by which the cheese-making, closing on the first of November, will be followed by three or four months of butter-making will put money in the pockets of every man. It will improve our homes; it will make our wives and families happy; it will make our young men contented and keep them at home by engaging them in a pleasant and profitable Canadian industry. I do not blame the young man who leaves the farm considering the methods that have too long been followed. The record of the past has not been what it should be; an average of thirty dollars in all that has been got from the cow even in this premier Province or Ontario. We are expected to be the leaders in all that is progressive in this great country. There is room for improvement, and for making that improvement we shall be splendidly rewarded. Insist upon your factories being fitted up in the best manner and if you find your cheese-maker idling his hours away order him to take a course in the Dairy School at Guelph so that he may increase his skill and thus be able to produce the finest goods. We have too many men who are waiting for a ninety cents a day job and not enough who are determined to attain and keep the first place in their profession. Make yourself more than an ordinary man. Do it for your own sake and with the patriotic determination to make your country the best in the world.

The PRESIDENT: You will be glad to hear a short address from Mr. Chadwick.

AN HONORED VETERAN.

Mr. C. E. CHADWICK, on coming forward, was received with great applause. He said: Your very flattering reception makes a deep impression on my heart. In all probability this is the last time I shall meet you in Convention. The sands of life are running low and soon the glass must be turned that they may begin afresh. I meet you with a great deal of pleasure. In an experience of five-and-twenty years this is the most successful Convention I have ever known. This is the afternoon of the third day, and we have still an audience that we should have considered large at any previous Convention, an audience composed of men and women thoroughly representative of those who have made this great country what it is to-day. But few of those are here who took part in the early labors of settlement. I came here fifty years ago, when this section was almost an unbroken fallow. To the hardy pioneers of those days who struggled bravely through herculean labors all honor is due. I regret that I am not physically able to

speak to you at such length as I desire to do. But I have made a few extracts from an official document in order to show you what has been done and to give you some idea of what we may hope for in the future. We hear it said too often that our country is going to the dogs and that our people are leaving us. Can they go and find a country better than this. There is no such land on the face of the earth. It is said that our farm lands are depreciating in value. It would be most wonderful if it were not so. Show me a country to-day where farm lands have not depreciated. But take our country as a specimen. In 1880 the assessed value was $238,326,608. In 1885 the record was $244,334,130. In 1889 it was $242,706,720. In 1892 it was $243,699,880, an increase from 1880 to 1892 of $5,173,192. This does not show ruin and decay. Look at the people here Do they look as if they were poor or lacking in prosperity? I have here the figures from the trade and navigation returns showing the value of agricultural produce exported in 1892: Horses, $1,484,431; horned cattle, $7,749,399; sheep, $1,429,047; eggs, $1,089,823; butter, $1,273,094; cheese (and now we come to the staple article), $12,554 286. This is a vast change within a few years—from importing cheese to the extent of hundreds of thousands of dollars to exporting over twelve millions of dollars' worth in a single year.

Mr. DERBYSHIRE: $13,400,000.

Mr. CHADWICK: Those are the returns for last year, I suppose. After a stirring appeal to the loyalty and patriotism of his audience, the speaker concluded as follows: I feel I am unequal to the task of speaking to you as I would wish. I thank you for the kind demonstrations with which you have received me. I hope this organization may continue to flourish as it has flourished in the past, and I close by expressing my very best wishes for you all.

The PRESIDENT: We have all listened with the greatest interest and pleasure to our friend Mr. Chadwick. We trust that he and Mr. Losee and other veterans may long be spared to witness still further development in this great industry for which they have done so much. I have pleasure now in introducing to you a young man who has had much to do with the development of the dairy industry in another part of the province where the advance has been not less remarkable than in the west. I introduce to you a man who began his dairy experience twenty-three years ago, when he had eight cows, and who is now the owner of sixty cheese factories and ten creameries. In that time there had passed through his hands money, of which the farmers have to a very large extent got the benefit, to the amount of no less than five millions of dollars. I mention these facts to show the young men of this country that there is a chance of success for them here, and that in connection with agriculture. I have pleasure in asking Mr. Macpherson to address the meeting.

CHANGED CONDITIONS OF AGRICULTURE.

Mr. D. M. MACPHERSON: I feel highly flattered at the way in which your worthy chairman has introduced me. Every one of us to-day is glad to rise to his feet to do honor to the man who has done something to build up this industry and thus assist in the development of the country. This should be an incentive to every young to go on and do his duty. You are here to learn what is right in dairying, and in order to do what is right it is necessary to know what is wrong, in order to avoid it. I am glad to see so great an interest taken in these matters. To find so intelligent an audience ready to hear the experience of others that they may profit by it is a most encouraging sign. The question before us is: How is it possible for the farmer to increase returns for every day's work done on the farm? Hiring a man for a dollar a day how can we arrange it that he shall produce for us more than a dollar a day? It is well enough to urge the farmers to feed their cattle better and so increase the product, but that increases the work per acre on the farm. What we must aim at is to increase the product per acre. We have lost sight of this most important factor of the success in our work. The true

plan, as I have told you, in my opinion is, instead of having one or two agricultural schools in the province, is to have a school in every county and, if possible in every township. These schools do not need to be expensive—they need not cost the province one dollar. It may cost in the beginning, but it will pay back every dollar with interest. How can we have schools in each township or county? We must take in each place a small farm of say fifty acres of the average land of the county, but run out, and by the expenditure of a certain amount of capital bring it up to such a condition that it will make money so as to return the capital expended with interest. Let that farm be a school which the farmers can visit, and thus receive information as to the best methods of feeding cattle and feeding plants. We have failed in the past to take account of this latter. But the two go naturally together, for if you feed the cattle well the natural result is that you feed the plant well. The farmer could watch the working of the Government farm in his own section, and see there practically carried out by the best methods the work he himself has to do, and could learn how to increase his income and how to decrease his outgo so as to leave the balance in his own favor, and this is the criterion of success in farming as in every other business. As farmers we find it costs more each decade to live. Let me say here that the expense of living has come to stay. It costs more than formerly to furnish what the civilized man requires, more to educate his children, more to keep up with the times, and that increase of cost is going to remain, and, more than that, it is going to grow. If we cannot increase our income in proportion to the necessarily increased outgo, there is only failure ahead of us. We cannot control this increase of expenditure, and to avoid disaster there is only one course—we must add to our income. If I were to tell you that a man hired at a dollar a day could be given such appliances and taught such methods of work as would enable him to earn for you $2 to $3 every day of the year, you might doubt what I told you. But, if I could take you to a farm where this was being actually done, what further evidence could you require? None; for seeing is believing. Hence I believe we must get closer to the farmers with our public expenditures and spend in practical work for them some of the money that is now being spent in bonusing railways and in other public improvements. I do not say that this money is spent altogether unworthily, but it is spent lavishly so as to increase the outgo rather than the income of the farmers. By carrying out the work I advocate we shall be putting into force only the principle we have used in respect of cheese production. See what we have done in a few years, starting, as I well remember, twenty-three years ago, when our cheese was half a cent lower than that of our neighbors, we are to-day from one-half to one cent ahead in the market. Why is this? Because we have adopted practical methods. We have sent the best skill to the doors of our makers and have placed in their hands the means of producing the best results. We get the best price on the market, but instead of that price being eleven to twelve cents, as it was fifteen years ago, we must be content with nine to ten cents. Thus, on the same product our income is less than it was fifteen years ago, while our expense of living is greater. We see the result in the fact that the real products of farming are less than they were fifteen years ago. Here is a problem that faces the community, and if the people are to be successful in solving it, it must be by working to a plan, and I see no plan that will produce such good results as to practically demonstrate to our farmers the methods by which they may make their income greater than their outgo. The division of labor is a most important factor in success, but care must be taken that the labor is so directed as to increase the product, and yet at the same time avoid loss through one laborer interfering with another. With the division of labor I have practiced for four years, I am able to employ four men the year round, and the result of their labor is that for an expenditure of about $3 to $3.50 the income is $8 to $10. To achieve the best success the farmer must not be satisfied with a fair return in the summer which shall be eaten up by an unprofitable winter. This is not only a loss in itself but it is discouraging, and so reduces the value of the work that is done. We have heard to-day of the phenomenal results with some cows. But when you come to estimate the product on the basis of the acerage in use, you often find that the result is a loss. What is the use of producing these phenomenal results if they are not profitable. I find the average cow of our country giving 3,000 pounds of milk in the season of six months, and, if properly

handled the year through, they will give a more certain product and a more certain profit than these phenomenal cows. These phenomenal cows are harder to handle, they are high strung and likely to go wrong. The average good cow of our country is the best animal to keep. Keep her harnessed and make her work every day in the year. Let me not make any reflection upon Sunday work, but if the cow is properly harnessed the fact remains that she is working for you Sunday and Monday, rainy day and fine day, good season and bad season—no matter what the circumstances, you find her giving you a daily return. If you have horses in the stable that are not working for you, then it comes down to this, that you are working for the horses. It makes a big difference in the profit of dairying whether you are working for the cows or the cows are working for you. We find in the best experience that the cows are working for us six or eight months in the year, and for the rest of the year we are working for them. We must harness the cows and use them every day. The cow can produce for ten months in the year. I make them work even when they are not producing milk, for I feed them so that they are improving their condition and thus preparing themselves to produce better results than they otherwise would do. In all these matters we must study the problems closely and apply business principles. Let no dairyman stand still. No dairyman should go to work without a clear cut plan to work upon, a plan that he can carry out to the letter. I throw out these suggestions to set the young men thinking. I see these young men here, men anxious to better their condition, and looking forward to a greater return for their labor than they now receive. You must make the land produce more per acre, and to do that you should count all your returns on the basis of acerage. See that you do not increase your expenses without a more than corresponding increase of income. He is a fool, I care not what his position, who will increase his expenses in such a way as to decrease his income. He is a fool who will buy machines and go into debt for them. I wish I had time to discuss these questions more fully, but I hope in the near future, with the assistance and the advice of others, to bring into effect the desirable reforms I have spoken of, and I shall not rest until I have done something to improve materially the condition of my fellow countrymen.

The PRESIDENT: I am sure you have been delighted with Mr. Macpherson's able remarks. I may tell you that when he makes a promise you may consider that promise fulfilled. As Mr. Macpherson is one of the farmers going into the Legislature pretty soon, there is a good deal in any promise he makes.

Mr. MACPHERSON: If you will allow me for one moment—I forgot to speak of the Babcock test. The proof in its favor is conclusive. Not only should the factories and creameries use it, but every farmer in the land should possess and use one of these machines, so that he may know the class of milk that each cow gives, and may thus know exactly how his business is going and how improvements can be made. It will be a check upon the results of the factory, and it will stimulate you to go on and improve in every way. A small Babcock test can be got very cheaply. One for four or five samples can be bought for five or six dollars.

A MEMBER: Would that be sufficient without means of testing the specific gravity?

Mr. MACPHERSON: Yes.

Mr. JOHN ROBERTSON: In milking your own cows the question of specific gravity is of very little consequence, for you know whether your own milk has been tampered with or not.

A DISCUSSION REGARDING SILOS.

A MEMBER: I would like to ask Mr. Gould what is the object of putting twenty pails of water on top of the ensilage?

A VOICE: To keep it from catching fire. (Laughter.)

Mr. GOULD: It is simply to make the surface of the silo more moist and increase the heat, so that you soon have the growth which forms a blanket over the ensilage; you get the same result in two or three days, instead of waiting for two or three weeks. That blanket on top prevents decay underneath.

A MEMBER: In regard to the cutting or crushing of the corn for ensilage, does the corn, if cut too short, injure the cow's mouth?

Mr. GOULD: Cut the corn half an inch long if you have to get the engine up to 600 clips per minute, and then you won't have any cows with sore mouths. In the course of eight years I have learned of a great many cows with sore mouths from eating ensilage, but every one of them, when I went to enquire, was in the next county.

A MEMBER: Suppose the corn failed, what do you do for ensilage then?

Mr. GOULD: Last year was a pretty good test whether corn will fail or not. It never rained enough to lay the dust from the 10th of June until the corn was in the silo. We cultivated it not more than one inch deep so as not to disturb the root, and the corn made a magnificent growth. Cultivate enough to keep the weeds out, yet not enough to disturb the roots, and unless lightning strikes it or a hurricane comes that way, your ensilage will be all right. We cultivate our corn twice before it is up—once when it is coming up, and twice after it is up.

A MEMBER: How wide do you plant?

Mr. GOULD: Three feet eight inches apart, and put the planter in once every six inches. That is a little too thick, but the Scotch harrow and weeder will knock one out every now and again, so in the end we get about what we want.

A MEMBER: How many tons do you get to the acre?

Mr. GOULD: Well, how long is a piece of string? Your question is a perfectly fair one, but under no system of agriculture can a man be sure of raising so much per acre. If we get sixteen to eighteen tons of good ensilage corn per acre we are satisfied.

A MEMBER: Can you tell us anything about a harvester for ensilage?

Mr. GOULD: I have seen them; but a man with a knife is the best harvester we have found yet. The difficulty with a machine is that it takes three men and a span of horses to run it. Then you have this $150 or $200 worth of machinery working three days in the year and rusting 362.

A MEMBER: You have no objection to cutting the corn on a wet day?

Mr. GOULD: I never heard any objection, except from the fellow who was doing the work.

A MEMBER: Do you run the cutter by horses or engine?

Mr. GOULD: We find the engine cheaper. If you don't have to hire the horses they may be better, but if you do, you can hire the engine better. Two hundred pounds of coal will run the engine all day, and it will take four bushels of oats for the horses —that is, if the other fellow feeds your oats.

CANADIANS AND THE WORLD'S FAIR.

The PRESIDENT: Prof. Robertson is down for a paper, and we have been holding him back. No doubt you will be glad to hear him now.

Prof. ROBERTSON then delivered an address on The Canadian Dairy Exhibits at the World's Fair. This address will be found in the report of the Eastern Dairymen's Association.

SECRETARY'S REPORT.

Mr. J. W. Wheaton, Secretary of the Association, presented the following report :

To Members of the Dairymen's Association of Western Ontario :

Gentlemen,—I have much pleasure, at this your 17th Annual Convention, of presenting to you my Annual Report.

I began my work as your secretary on October 20th, 1892. The duties assigned to me by your Executive Committee, and which were fully discussed by the Board of Directors previous to my appointment, and made public at that time, are given in the following order :

(1) The new secretary shall devote all his time to the interests of the Association, and shall have charge of the office work, and make necessary arrangements for the Annual Conventions, Directors' meetings, etc.

(2) He shall arrange to attend and address as many annual meetings of cheese factories and local dairy meetings in Western Ontario as his time will allow, and in these addresses give special attention to imparting practical information on the selection, care and feeding of dairy cows ; the proper care and handling of milk for the cheese factory ; the proper disposal of the whey at the factories ; the system of paying for milk for cheese-making by the percentage of butter-fat ; the winter dairying movement, and such other information on the best practices in dairying as will be helpful to the patron, and tend to promote the dairy industry of this section of the Province.

(3) He shall endeavor to bring the work of the Association more prominently before the people through the medium of the press.

(4) He shall make a special effort to increase the membership of the Association and to bring its work more particularly before the farmers and patrons of cheese factories, with a view to getting them to take more interest in its operations, and to become members of the Association.

(5) Finally, he shall devote his time generally, as may be considered for the best interests of the Association and the good of the dairy industry of Western Ontario.

The manner in which these duties have been performed, and how the work of the Association has progressed, are given in the substance of this report.

Between October 20th, 1892, and December 31st, 1893, your secretary attended 67 annual meetings of cheese factories and local dairy meetings, and addressed over 4,500 farmers and patrons on various topics pertaining to the interests of dairying. Thirty-four of these were annual meetings, and the remainder special meetings called to discuss dairy matters only. Though, as a rule, there was a larger attendance at the annual meetings, yet there was usually more interest shown and more beneficial discussion indulged in at the special meetings. It commonly happened that at many of the annual meetings, and especially at those connected with the larger factories, there was so much business to be done, that either the address was cut short or there was no time for discussion, and thus, what otherwise might have been profitable meetings, were not so for lack of sufficient time. The annual meeting is the place where the little grievances of patrons are ventilated and settled (and rightly so) : the business of the year reviewed, and preparations made for the next season's work, and when these are properly adjusted and arranged for, there is not much time for other matters. At most of the smaller factories, however, the business is not so great, and can be got through with much more quickly, leaving more time for the address and the discussion. My own opinion, consequently, is that, unless the factorymen in many of the larger factories can be educated to conduct their business with more despatch, or induced to curtail some of the proceedings (and it is difficult to see how this can be done), more good will be accomplished by arranging for special local meetings. When these are properly and well advertised and arranged at a suitable time, a good attendance can be secured. The patrons gather to hear and discuss dairy topics only, and derive more benefit by not having the time taken up with anything else. Considering the difficulties herein mentioned, the meetings so far have been very successful and productive, we hope, of much good, both to the patron and manufacturer.

Mr. T. B. Millar, the competent inspector for the Association, has also, since the beginning of this new work, attended 27 meetings, and given practical addresses to 1,500 patrons and farmers on the various phases of dairying. He reports fairly good meetings, with considerable interest in the winter dairying movement and paying for milk by the percentage of butter-fat. A number of meetings were also attended by the President, some of the Directors and others, under the auspices of the Association, which also were productive of much good. In reference to this particular line of work, 105 meetings were attended and practical addresses delivered to upwards of 7,000 patrons of cheese factories and others.

There were a number of meetings, of which notice was received, that could not be overtaken because of other engagements and so many annual meetings coming on at the same time.

Though the results may not be seen at once in this new line of work, yet there is no doubt that everyone who attended this series of local meetings has a better knowledge of the business of dairying and a higher appreciation of the Association and the good work it has done in the past, and is now doing, to promote the dairy industry of this western peninsula.

The very successful Annual Convention held in London last year was supplemented by four local conventions at Dutton, Tilsonburg, Brantford and Ripley during March. Though this was an entirely new venture on the part of the Association and much doubt was felt as to the result, still it is exceedingly gratifying to be able to report this as one of the most successful branches of the year's work. The attendance at all of these meetings was good. Special mention must be made, however, of the Tilsonburg and Ripley meetings. These were eminently successful, and beyond the highest expectations of those arranging them. At the Tilsonburg meeting the attendance of patrons and farmers was much larger than at many of the Annual Conventions; while at Ripley the hall secured for the purpose was crowded to the doors.

Your Executive Committee was successful in securing capable and practical men to address these gatherings. We were fortunate in securing Prof. Robertson, Dominion Dairy Commissioner, for the Tilsonburg and Brantford meetings, and Prof. Dean of the Ontario Agricultural College, for Ripley and the Brantford meeting as well. It may be safely stated that upwards of 1,500 patrons and farmers were directly reached by means of these local conventions.

Without at all prejudicing the minds of any in reference to this new work, I may here state that I think the holding of local conventions in various parts of Western Ontario should be one of the most important branches of the Association's work during the winter months and that arrangements should be made at an early date for a series of local gatherings in such places as may be deemed suitable and where the information imparted will do the most good. The plan adopted last year was, to interview or communicate with the townspeople and dairymen in the locality where it was proposed to hold a meeting and get them to undertake to advertize the Convention and get the people together, the Association providing the speakers. This scheme worked well and had the combined effect of securing large gatherings at these meetings and of getting the local dairymen and towspeople personally interested in the work of the Association.

We are glad to report still another new and successful venture on the part of the Association. In April and the early part of May, arrangements were made by your Executive to have practical instruction in the best methods of making early spring cheese and in operating the Babcock milk-tester, given in four factories in the west. The factories chosen were the East and West Oxford, West Oxford, Harrietsville and Elma. These factories were not as well situated as could be desired to cover the territory, but were selected more especially because they began operations early in April, and thus furnished an opportunity to makers to visit them before beginning work in their own factories. Mr. T. B. Millar, Travelling Instructor for the Association, took charge of the work at East and West Oxford; Mr. J. F. Williams, a former Inspector, at West Oxford; Mr. Wm. A. Bothwell, a student of the Provincial Dairy School, at Harrietsville; and Mr. James A. Gray, also a student at the Provincial Dairy School, at Elma. Mr. A. T. Bell, of the Tavistock Dairy School, who was expected to take charge of the work at one of these

places, was unfortunately prevented from doing so. The Executive were successful however in securing his services for a few days at Elma.

The attendance at these places was very good considering the difficulty there was in advertising the work and reaching the cheese-makers at that season of the year. The total number who received instruction was 60. No doubt if the work is continued another season a much larger attendance will be secured. The reports from those in charge indicate that this new effort on the part of the Association to provide practical instruction in improving the quality of our early spring cheese was much appreciated by the cheese-makers and others, who availed themselves of the opportunity. The following are reports and letters from those in charge of the work :

ATWOOD, May 20th, 1893.

To J. W. WHEATON, London, Ont.

SIR: Having been appointed by the Executive Committee of the Dairymen's Association to take charge of the Dairy School at the Elma factory during the month of April and the first part of May, I beg leave to submit to you the following report.

I commenced making on April 10th and closed the Dairy School on May 15th. During that time 25 makers visited our factory and received instruction in the best methods of making early spring cheese and also in working the Babcock milk tester.

Mr. A. T. Bell of Tavistock spent the 18th, 19th, 20th and 21st of April with us. The makers expressed themselves as being well satisfied with the principle of having these schools started and I have no doubt if they are carried on in the future that the attendance will be much larger than it has been this year.

On another sheet you will find the names of the cheese-makers who attended our school and also the number of days that each one spent here.

Hoping that this will be satisfactory to you, I remain.

Yours respectfully,

JAS. A. GRAY

WOODSTOCK, Dec. 30th, 1893.

To J. W. WHEATON, Secretary, Western Dairymen's Association :

SIR: Having been appointed by the Executive Committee to take charge of the Dairy School work at the Harrietsville factory during April and part of May, I beg leave to submit the following report:

I commenced work on April 10th and closed on April 23rd. During that time 16 cheese-makers attended and received practical instruction in the best methods of making early spring cheese and in operating the Babcock milk tester. The makers who visited us remained one day each. All expressed themselves as being well repaid for their time and trouble, and commended very highly the action of the Association in providing them with the means of acquiring practical information in reference to their own work.

I consider the work of Harrietsville to be satisfactory, and have no doubt that there will be a much larger attendance if the same line of work is continued another season.

All of which is respectfully submitted.

Yours truly,

WM. A. BOTHWELL.

INGERSOLL, ONT., January 8th, 1894.

MR. J. W. WHEATON, Sec'y W. D. A., London:

DEAR SIR,—In reply to your favor in regard to the number of cheese-makers and assistants who visited the West Oxford factory last spring, I may say that there were twelve, and those most interested gave me to understand that they had profited by so doing. I believe the selection of factories by your Executive in different localities that open early in the spring to be a step in the right direction, particularly to young men of limited experience. The factory for a while, in a manner being under the control of the Association, gives cheese-makers the right to visit the factory; discuss the different methods of manufacture and take an interest in the work, that at any other time they would feel a little delicate in doing. It assists them in preparing to commence their own work, gives them more confidence and should give them more skill. They see cheese-making in actual practice, and learn the best methods to adopt, the proper quantities of extract, color and salt to use, and can examine for themselves the results in the curing-room.

It appears to me that these stations if continued must lead to a more uniform make cheese in spring, and of better quality, which will be more satisfactory to the maker, the dealer, the consumer and all concerned.

Yours very truly,

J. F. WILLIAMS.

The attendance at the East and West Oxford factory was somewhere smaller than at the other places. An account of the work there is given in Mr. Millar's report.

The Dairy School was continued at Tavistock and also the work of the travelling inspector and instructor. The reports from these two branches are given by Mr. A. T. Bell and Mr. T. B. Millar respectively.

In compliance with the wishes of the Executive Committee, the services of your Secretary were available to render assistance to makers in operating the Babcock milk tester and to secretaries in making up accounts in factories where the system of paying for milk by the percentage of butter-fat had been adopted. Applications were received from 15 factories, which were visited during May and the early part of June, while a few more received visits later on in the season. As this report is already too long I will omit the list of factories visited.

This branch of the Association's work was timely and well chosen, as in a number of the factories visited, the makers were ignorant concerning the proper working of the Babcock machines and the secretaries were in doubt as to the proper method of making up the accounts. Consequently the help thus given was much appreciated by factory men, and the patrons had more confidence in the new system when they realized that the testing, etc., were being properly conducted, and that the Association was looking after their interests. In many of the factories visited no adequate preparation had been made to carry on the test properly. In some of these factories there was no proper place for keeping in safety the samples of milk to be tested, and many of the little things, such as a hot-water can, rubber-piping, etc., were wanting. It seemed as if a good many, relying upon the great simplicity of the test, considered that all that was necessary was to get a Babcock machine, and the work would be done of its own accord. Although, considering the results obtained and the importance of the work, the testing of milk by the Babcock machine is comparatively simple, yet it is absolutely necessary in order to carry it on properly and successfully that everything should be provided, such as a cupboard or room with lock and key for preserving the samples, and those other little conveniences which aid the cheese-maker in making an accurate and reliable test. When all these things are properly provided, the patron, who usually visits the factory frequently to see how his milk is testing, sees that the manufacturer or maker has made a business of it and is endeavoring to carry it on in the best way, and consequently he will be better satisfied and have more faith in the system. On the other hand, if things are run in a hap-hazard, unbusiness-like fashion, the patron will lose confidence at once and begin to doubt about the reliability of the test. It would be much better, if factories that are not prepared to provide everything for carrying on the test properly would postpone the adoption of the system until they are prepared.

In reference to the working of this new system, as far as can be learned at present, it has given very good satisfaction. True there are patrons connected with all the factories where it has been in operation who are dissatisfied and prefer to go back to the old method. These cases of dissatisfaction, however, rest chiefly with the man whose cows are giving an inferior quality of milk. It is but natural to expect that he would much prefer to increase the value of his own milk by the old method of "pooling" it with his neighbor's good milk. There have been some strange revelations connected with the working of this new system. Patrons, who at the meetings last winter strongly advocated its adoption, were not quite so favorable towards it, when they realized that their milk was not testing as high as they expected; while others who were strongly opposed to its adoption were inclined to favor the system because they realized more for their milk than they did under the old method.

A few factories that adopted the system last winter and commenced paying by test in the spring, quit after running a month or so. As far as can be learned, the chief reason was, that these factories had strong opposition from factories that had not adopted the system, and were likely to lose a number of patrons, who were not willing to have their milk paid for by test. This difficulty is likely to occur in localities where there is considerable rivalry between factories unless all agree to adopt the system. If the co-operative principle were further extended, and all the factories in each district would agree to adopt the system there would not be so much dissatisfaction, as dissatisfied patrons would not have the opportunity of getting their milk manufactured unless it were paid for by quality.

It is estimated that 50 cheese factories paid for milk by the percentage of butter-fat last season in Western Ontario. We may safely claim that in 25 of these nearly perfect satisfaction was given, in 15 fairly good and in the remainder considerable dissatisfaction.

Although nearly perfect satisfaction cannot be claimed in every case, yet every dairyman who has advocated its adoption by our cheese factories, must feel gratified that so high a measure of success has been attained in such a comparatively short time. There is great need, however, of strenuous effort on the part of every factory man, cheese-maker and dairyman in still further impressing upon the mind of the patron the correctness of this new method and the effect it will have in improving the quality of the milk and enhancing the value of our Canadian cheese.

When the change was made in the active secretaryship it was deemed advisable to change the headquarters of the Association as well. Consequently the office of the Association was removed to London as being more central and in easier reach of the dairymen than Ingersoll. A room was rented in a central location and fitted up for the use of the Association. Here the Board of Directors and Executive Committee held their meetings.

There has been a large amount of correspondence during the past year. The headquarters of the Association being looked upon in a measure—and rightly so—as a place where information could be had on all matters pertaining to dairying. There were received up to December 30th, 1893, letters to the number of 645 ; while upwards of 650 letters were sent out in reply to those and in connection with the general work of the Association.

A number of circulars referring to particular branches of the work were printed and mailed to the makers and representatives of factories during the cheese-making season. In March 500 circulars in the form of a prospectus were sent out, giving definite information in regard to the Dairy School work during April and May, and the different branches of the work to be carried on by the Association during the summer. In August 600 circulars were issued and mailed to cheese-makers and others, urging the importance of Western Ontario sending a thoroughly representative exhibit of cheese for the October competition at the World's Fair, and giving specific information as to the shipping and selection of cheese. Through the kindness of the Dominion Dairy Commissioner, a bulletin was mailed with each circular specifying the number of entries that could be made and the kind of cheese wanted, and arrangements were made to have labels and entry forms supplied from the secretary's office. This means of disseminating information had a two-fold result. It served to convey to the right parties what it was desired that they should know, and also to bring the work of the Association more prominently before the public and to show dairymen how active it was in looking after their particular interests.

Your Executive Committee made arrangements for expert judges to visit the factories as far as possible and make selections of cheese to be sent to Chicago. In this particular they were ably assisted by the Dairy Commissioner, who agreed that his Department should bear the travelling expenses of the parties chosen. It may not be out of place just here, on behalf of your Executive Committee, to thank, not only Prof. Robertson for his kindly assistance, but also the cheese-buyers, who, at some inconvenience to their own business, willingly gave their time to the selection of the cheese which brought so much honor and glory to Canada.

During the year we endeavored to keep the work of the Association prominently before the public through the medium of the press. In this regard our efforts were crowned with a large measure of success. The press ably assisted, and were quite willing to publish any matter in reference to the Association and the dairy industry we were able to send them.

The membership of the Association has largely increased. There were on the list as members for 1893, 611 names. This large increase has been due in a large measure no doubt, to the fact that the fee was fifty cents instead of one dollar last year; but it is also due to a great extent to the work of the Association being brought before the dairymen at the local meetings and to their being personally solicited to become members. It is very difficult, sometimes, to get those who are most benefited to join an Association of this kind. A great many dairymen seem to think that, as it has got along to the present it can pull through in the future. It is the duty of every dairyman, however, to support the organization that looks after his interests. By doing so he not only contributes towards its financial support, but also shows his sympathy and

interest in the work as well. It only costs the nominal sum of fifty cents, and the Secretary will be only too glad to receive your name and to place it in the proper place on the membership list.

A list of the the cheese-makers in Western Ontario with their factories and post-office addresses has been compiled and kept in the the Secretary's office. It is difficult to get and keep the correct adresses of every cheese-maker, as they change so often; but if every maker would notify us at once when he changes factories or changes his address the difficulty would be considerably lessened. This list is kept for the convenience of the Association and for the cheese-makers as well. It will pay every maker to take a little trouble in this regard and notify us when the change is made so that he may receive the circulars and bulletins sent around from time to time.

Before closing this lengthy report I wish to express my thanks to the Board of Directors and members of the Executive Committee for the kind and generous treatment I have received at their hands during the past year and trust that our relations in the future may be equally as pleasant and profitable.

All of which is respectfully submitted.

Your obedient servant,

J. W. WHEATON.

REPORT OF COMMITTEE ON RESOLUTIONS.

The report of the Committee on Resolutions was then presented. The resolutions reported were considered *seriatim* and adopted as follows:

Moved by D DERBYSHIRE, seconded by D. M. MACPHERSON, that we the members of the Western Dairymen's Association, in convention assembled, hereby record our appreciation of the eminent services rendered to the dairy interests of Canada by Mr. A. F. MacLaren, who acted as judge on cheese at the World's Fair, and whose ability, good judgment and fairness were recognized by his fellow judges from the United States and those officially connected with the dairy exhibit, to the honor and advantage of Canada.

Moved by J. W. SCOTT, seconded by D. LEITCH, that we the dairymen of Western Ontario, at this meeting, record our appreciation of the assistance rendered the Dairy Commissioner in securing a worthy exhibit of Canadian cheese at the World's Fair by the Directors of this Western Association, and by the buyers who responded to their invitation and devoted considerable time to the selection of cheese for that exhibit. We hereby thank them for their efforts, which resulted in bringing so large a proportion of awards to Western Ontario.

Moved by L. A. PRICE, seconded by WM. FEWSTER, that we, the dairymen who have attended this Convention, tender our hearty thanks, and record our warm sense of appreciation, to the outside speakers who have been present at these meetings, some of whom have come voluntarily, at considerable inconvenience, and have aided, with others, in making the meeting valuable to all present. We hereby thank our American friends, as well as our own speakers, for their contributions to what has been a grand and successful dairy convention.

Moved by JAS. F. WILLIAMS, seconded by A. F. MACLAREN, that the following gentlemen, namely, Hon. Thos. Ballantyne, Mr. Harold Eagle and Mr. J. F. Beam, be appointed to represent the Western Dairymen's Association at the Road Improvement Convention, to be held in the city of Toronto on February the 9th.

Moved by T. BALLANTYNE, seconded by H. WHITE, that the officers and members of the Western Dairymen's Association express their thanks to the Mayor and Corporation of the town of Ingersoll, and to the President and members of its Board of Trade, for the cordial reception given to all who have attended this meeting and for the excellent

arrangements made to ensure its success. We record our opinion that it is largely through their efforts that this has been the largest and most successful convention held in the history of the Western Association.

The following resolution was moved by J. F. WILLIAMS, seconded by R. FACEY:

Whereas, the Executive Committee of the Western Dairymen's Association have in the past been in the habit of making an annual grant to the Industrial Exhibition of Toronto and the Western Fair of London for the purpose of awards on cheese for the benefit of cheese-makers, which we do not believe is giving general satisfaction;

We are, therefore, of the opinion that better results could be obtained by awards being given at the annual convention, where the defects could be better explained.—Lost.

Moved in amendment by L. A. PRICE, and seconded by T. J. DILLON, that the matter be referred to the Executive Committee. The amendment was carried.

REPORT OF COMMITTEE ON DAIRY UTENSILS.

Your Committee have found on exhibition quite a large number of dairy utensils, most of which seem to be well adapted to perform the work they are intended for. We do not think it necessary to enumerate the different articles or exhibitors, nor to make special mention of any exhibit, believing that cheese-makers have the necessary knowledge of these things to judge intelligently for themselves.

We are glad to see, however, that better accommodation than usual has been afforded exhibitors, and we would recommend that in future the exhibition of all kinds of utensils be encouraged as much as possible, in order to afford makers and factorymen an opportunity of judging by comparison which machines are best suited to their purpose.

The Report was adopted.

AUDITORS' REPORT.

We hereby certify that we have examined the accounts of the receipts and disbursements of the Dairymen's Association of Western Ontario, and compared the vouchers and find them in accordance with the financial statement presented.

LONDON, January 22nd, 1894.

JOHN ROBERTSON, }
J. A. NELLES, } Auditors.

(The financial statement will be found in the Appendix.)

THE BANQUET.

The banquet in the evening, tendered the Association by the citizens of Ingersoll was largely attended, and in every respect was a grand success. In addition to speeches by leading dairymen present, addresses were delivered by Sir Richard Cartwright and Hon. John Dryden, Minister of Agriculture. Music and song were interwoven into the programme, and Mr. J. C. Hegler, chairman of the local committee, was heartily commended for his splendid work.

III. CREAMERIES' ASSOCIATION OF ONTARIO.

OFFICERS FOR 1894.

President, - - - - - - D. DERBYSHIRE, Brockville.
1st Vice-President, - - - - - A. WENGER, Ayton.
2nd Vice-President, - - - - JOHN S. PEARCE, London.
Secretary, - - - - - - JOHN HANNAH, Seaforth.
Treasurer, - - - - - - R. J. GRAHAM, Belleville.

Directors:

Division No. 1.....JOHN H. CROIL, Aultsville.
Division No. 2.....A. CAMPBELL, Ormond.
Division No. 3.....T. J. MILLER, Spencerville.
Division No. 4.....JOHN SPRAGUE, Ameliasburg.
Division No. 5.....ROBT. PHILP, Cadmus.
Division No. 6.....W. J. PALMER, Belleville.
Division No. 7.....CHAS. SNEDICKER, Haysville.
Division No. 8.....W. G. WALTON, Hamilton.
Division No. 9.....JOHN HANNAH, Seaforth.
Division No. 10.....WM. HALLIDAY, Chesley.
Division No. 11.....T. BROWN, Holstein.
Division No. 12.....A. WARK, Wanstead.
Division No. 13.....E. ZINKANN, Weliesley.

LIST OF MEMBERS

FOR 1894.

Name.	P. O. Address.	Name.	P. O. Address.
Ackerman, J. H.....	Milford.	Forin, Jno	Belleville.
Ashley, R	Foxboro'.	Foster, F. S.....	Belleville.
Ayer, A. A. & Co	Montreal, Que.	Frost, Jno. G	Belleville.
		Furniss, O. S	Toronto.
Bell, John	Belleville.		
Bensley, W.....	Warkworth.	George, Wm	Ayton.
Biggar, W. H	Belleville.	Gibson, W. J	Belleville.
Biggar, J. L.....	Belleville.	Gill, J. M.....	Brockville.
Bissell, W. J.....	Algonquin.	Gough, E. D	Belleville.
Bogle, Robt.....	Belleville.	Graham, R. J.....	Belleville.
Brenton, F. W.....	Belleville.	Graham M	Belleville.
Brintnell, E. P	Belleville.	Green, Chas.....	Belleville.
Brubucher & Snyder ..	St. Jacobs.		
Buchanan, E. A.....	Brockville.	Haggerty, Jas.....	West Huntingdon
Bull, H	Belleville.	Hamilton, J. M	Toronto.
Burnie, Matthew	Spencerville.	Hanley, J. C	Belleville.
		Hannah, John.....	Seaforth.
Campbell, Alpin	Ormond.	Henderson, L	Belleville.
Carman, Thos	Belleville.	Hendrich, M. J	Belleville.
Cherry, E. T	Belleville.	Hoff, Henry	Ayton.
Clark, T. S	Belleville.	Hinman, E. J	Grafton.
Collins, D	Belleville.	Horsley, A. E.....	Wooler.
Connor, S.....	Brockville.	Hubbel, S.....	Glen Ross.
Cook, W. S.....	Belleville.	Hudson, W. P	Belleville.
Cooley, J. E	Compton, Que.	Henry & Hudson	Belleville.
Cooper, C. R	Toronto	Hume, Jas	Ayton.
Corby, H., M.P	Belleville.	Hurley, J. M	Belleville.
Cossitt Bros	Brockville.		
Croil, J. H	Aultsville.	Jamieson, Jas	Belleville.
Crothers, Jacob	Belleville.	Johnson, J. W.....	Belleville.
		Johnston, Alex	Athens.
Daly, P. R	Foxboro'.	Jones, Clem.....	Belleville.
Dargavel, J. R	Elgin.		
Davis, A. A	Brockville.	Keirl, Wm	Bayside.
DeLong, W. E.....	Belleville.	Ketcheson, Jas	Belleville.
Derby, Andrew	Hampden.	Kinsey, J.....	Stouffville.
Derbyshire, D.....	Brockville.		
Doctor, W	Belleville.	Lazier, R. L.....	Shannonville.
Dunnet, J. W.....	Belleville.	Lazier, S. A.....	Belleville.
		Lewis, Frank	Belleville.
Farley, Jas	Belleville.	Lewis & Patterson	Brockville.
Fearman, F. W	Hamilton.	Loucks, A	Foxboro'.
Finkle, J. R	Belleville.	Lucas, Steele & Bristol	Hamilton.
Fish, A. E	Belleville.	Lynn, Jas.....	Belleville.
Flint, J. J. B	Belleville.	Madden, E. J	Newburgh.

LIST OF MEMBERS FOR 1894.—*Concluded.*

Name.	P. O. Address.	Name.	P. O. Address.
Mallory, B	Frankford.	Sprague, W. E., M. D.	Belleville.
Matheson, R	Belleville.	Sprague, Jno	Ameliasburg.
Miller, Thos. J	Spencerville.	Sprague, L. F.	Mountain View.
Mikel, W. C	Belleville.	Spring, J. W	Castleton.
Monroe, Chas	Ventnor.	Steele, Thos	Trenton.
Moon, A	Belleville.	Stewart, Thos	Belleville.
Moore, C. F	St. Clair, Mich., U.S	Sutherland, Jas.	12 Port St., Mont., Quebec.
Moulton, T. D. & Co	29 Broadway New York, U. S.	Tanner, Chas	Nenagh.
Murphy, R. G	Elgin.	Taylor, W. A	Belleville.
McGrath, W. J	Belleville.	Taylor, C. W	Brockville.
MacKenzie, J. A	Brockville.	Templeton, J	Belleville.
McLeod, Wesley	Montreal, Quebec.	Thompson, R	Napanee.
		Thompson, W. E	Belleville.
Northrup, W. B	Belleville.	Tracy, Robt	Belleville.
Pearce, John S	London.	Vanblaricom, W	Belleville.
Philp, Robert	Cadmus.	Vandewater, G. S	Belleville.
Pitceathly, D	Belleville.	Vanderwort, A	Stirling.
Porter, E. G	Belleville.	Vermilyea, N	Belleville.
Pringle, Jno	Brockville.		
Pringle, Henry	Belleville.	Wallace, Jas	Belleville.
Publow, J. A	Brockville.	Wallbridge, F. S	Belleville.
		Wallbridge, Geo	Belleville.
Ramsay, R. H. & Son	Toronto.	Wallbridge, E	Belleville.
Randall, David	Ayton.	Walker, Jno	Belleville.
Rathbun Co., The	Belleville.	Walton, W. G	Hamilton.
Read, R. J	Belleville.	Walton, E. M	Bronte.
Reiner, J. G	Wellesley.	Walker, Dr	Belleville.
Ritchie, Geo	Belleville.	Wark, A	Wanstead.
Robertson, D	Belleville.	Waters, D. M	Belleville.
Robinson, W. B	Belleville.	Wenger, A	Ayton.
Roblin, Ed	Ameliasburg.	Wenger, Noah	Ayton.
Roblin, John	Rednersville.	White, John	Belleville.
Ross, Jas. F	Kirkton.	Whitton, Jas	Wellman's Corners
Rowe, Elgin	Brockville.	Widmeyer, Otto	Ayton.
Rutherford & Wood	Bolton.	Wilmot, S. T	Wallbridge.
Rutherford, R. J	Colborne.	Wright, Geo	Elora.
		Wrightman, H. G. & Co	Hamilton.
St. Charles, Jas	Belleville.		
Shevelin, Jas	Belleville.	Yonker, W	Belleville.
Smith, F. B	Belleville.	Young, Andrew	Princton.
Smith, C. F	Belleville.	Young, R. J	Belleville.
Somerville & Co	Hamilton.		
Southwork, T	Brockville.	Zinkann, J. N	Wellesley.
Spears, A	Bronte.	Zinkann, Eph	Wellesley.
Sprague, Mark	Ameliasburg.	Zufelt, L. A	Chesterville.

NINTH ANNUAL MEETING

OF THE

CREAMERIES' ASSOCIATION OF ONTARIO.

BELLEVILLE, JAN. 10TH, 1894.

FIRST DAY—MORNING SESSION.

The Ninth Annual Convention of the Ontario Creameries' Association was opened in the City Hall here this forenoon with the following address by the President, Mr. D. Derbyshire, of Brockville:

THE PRESIDENT'S ADDRESS.

It is my pleasant duty this morning to open the ninth annual convention of the Ontario Creameries' Association in this historic city, where we have met with such a warm reception, and I take this opportunity of thanking the citizens of Belleville and vicinity on behalf of this Association for the same. This section has always been active and energetic in promoting our great national industry, until now we have the proud distinction of being the leaders of the world in making fancy butter and cheese. That we have made rapid advancement since the formation of this Association no one will deny. The changes that have taken place in the conditions and surroundings of our dairymen during these nine years in Ontario are perhaps greater than have attended any other industry, and I am sure we can do even better work in the future. We have 62 regular creameries in this Province and 12 winter creameries—a gain of over 50 per cent. We find that where dairying and stock-raising are carried on intelligently that the farmers are progressive and well-to-do, which should stimulate us to greater activity in seeing that the proper instructions are placed within the reach of all our friends, so that the best possible work can be done in every section of this empire Province.

The past year has been very important to the dairymen of this country, and we should learn many important lessons. We met our neighbors in friendly competition at the World's Columbian Exposition, and, while the results were not so gratifying to us as to our brethren in the cheese industry, still they are full of encouragement and use. Our butter was judged by three eminent experts, two from the United States and one from Canada. The body of our Canadian butter was, on the whole, rated very high, but most of our exhibits lost several points on flavor, which we can remedy by careful attention; and I know our creamery men will cheerfully do anything possible to be leaders in the art of making fancy creamery butter. The circumstances were not favorable to Canadians, by reason of the distant points from which most of our butter had to be sent, taking about ten days in transit, besides the restrictions of the United States Customs regulations. It was impossible to have our butter stored in the refrigerator at Chicago, and then brought to the judges as required, while our American friends were not slow to take advantage of having their butter in the refrigerator until the judges were ready; so I think we did exceptionally well to win 27 awards, and have such a large number of our exhibits come within a point of the minimum fixed for this class. Quite a number of our exhibits failed to score on account of using poor, off-flavored salt. I am sure we will all learn something from the wonderful exposition, and so improve our creamery buildings and have them properly equipped with cream-separators and modern machinery, with an educated butter-maker, who has attended our dairy school at Guelph, thoroughly understanding every detail, so that in future perfection will shine forth from every package of butter made.

In examining some of the fancy creamery butter at Chicago, and talking with the makers, I found that they were only using the latest and most modern apparatus, and were anxious to find out all they could about our methods. In short, these young men were fully alive to the importance of their calling. I found another fancy package, from a central creamery, with several skimming stations, which was nearly perfection, and I think well of this system, especially for winter creameries. After the regular cheese season is over one central factory can be fitted out properly for making butter, and the neighboring factories can have a separater only, and have the cream taken to this central factory. This will avoid long hauls and each patron can take his skim-milk home and enjoy the prestige of having his butter made in a large, influential creamery, where nothing but the finest goods are turned out.

The past year should also teach us another lesson—to make provision for the dry, hot weather, which is sure to come. In 1893 only a limited number of our farmers were prepared, and our cows decreased in milk nearly 50 per cent. in July and August. If you will allow them to go down, then you can rest assured they will not gain much that season. What a loss to our Province! If all our dairymen had been ready, with clean, airy stables, with screens to keep the flies out, and plenty of silage or other green crop, and kept the cows in the stables in the day time, turning them out at night, when the flies would not bother them, making sure they got all they could eat of the best food, plenty of pure water, salting them every morning, treating them kindly, we would have had two millions of money more among our dairymen in this Province, which would have meant prosperity to every industry. While so much depends on the success of our dairymen, and no business is so sure and profitable every year, I would urge all to commence the new year with a full determination to keep only profitable cows, in the best way, and give your undivided attention to every detail in connection with the business with which we are identified, so we can swell our exports of butter and cheese from thirteen to twenty millions in 1894. This can only be done by all building silos, and having plenty of good, nutritous food, to keep up the flow of the milk throughout the season.

We have prepared a pamphlet programme, giving the names of the most distinguished speakers on dairy topics on this continent, and the subject for discussion, and we hope to make this the most important dairy meeting ever held in our country. Anyone desiring information will kindly write their questions, and put them in the question box, naming the gentleman you desire to answer, and they will receive careful attention, as we are anxious to obtain for all the exact information they require.

I desire to especially thank Hon. John Dryden, the Minister of Agriculture, for his kindness and attention to our requirements in every particular during the past year; also Prof. Robertson, Dominion Dairy Commissioner, who has rendered us invaluable service. Our instructor, Mr. Sprague, has been active, and rendered valuable assistance to all our creameries. I especially thank the officers and members of this Association for their kindness and co-operation, and I am sure we can all look with pride to the work accomplished by us in 1893. With every member of this Association working together in our several localities, and influencing our friends not only to become members, but to improve everything in connection with the dairy, we shall become a power in this Province for good. (Applause.)

COMMITTEES.

The President concluded by recommending the appointment of the following Committees:

Order of Business—Mayor Wallbridge, Messrs. Hannah, Graham and Philp.

Finance—Messrs. Sprague, Wenger, Zinkann and Murphy.

Nominations—Messrs. Wenger, Millar, Graham, Halliday and Wark.

Dairy Utensils—Messrs. Pearce, Smith, M. Sprague and Walton.

Resolutions—Prof. Robertson, Messrs. Croil, Moyer and Walton.

Legislation—Prof. James (Deputy Minister of Agriculture), Messrs. Moyer, Brill and Brown.

CANADIAN BUTTER IN GREAT BRITAIN.

Mr. R. J. GRAHAM, Belleville: I may say that I am pleased to have listened to the address delivered by our worthy President, and glad that in his capacity as President he was able to attend the World's Fair and examine the products of our country and compare them with those of our neighbors and with fairly favorable results. I hope that the information he received there will be introduced into active service in our work in the creameries of this Province. It seems to me that unless we put in practice that which we learn at these conventions they are of no use to us; and, in order to make our creamery business a success, we should, on leaving these conventions, adopt the ideas that we think desirable and test them and find for ourselves whether the gentlemen who address us tell the truth or not. Sometimes theoretical ideas are good enough, but do not work out in practice. If we take these ideas home and apply them they may be of advantage, but unless we do this they will never be of any use to us, nor to the industry with which we are connected. I may say that during the past season I have had some little experience of the way in which our butter has suited the English trade, and I have had some flattering reports with regard to our mild creamery butter. It has brought good prices. In fact at one period during the season our best mild grade brought as high as the best Danish. (Applause). I believe we have just as good a country as the Danes for making butter; just as good food for our cattle; just as good cattle and just as intelligent men, and there is no reason in the world why we should not produce as fine butter as they do if we only apply the same skill to the business and see that our product arrives in England in proper condition. I have found in my little dealings with John Bull that he wants things as he wants them and it is not what we think is best but what he thinks is best that we must aim at securing. There is an unlimited market in England for butter and I think it is time that we in this banner Province, who are the leading people of the world, should go to work on this butter question and adopt the ideas of our worthy President and see that during the coming years our butter brings the highest price in the Old Country market and that when it comes to another world's exhibition we will be able to take the first position. (Applause). I move the adoption of the Committees named by the President.

Mr. JOHN SPRAGUE, Ameliasburg, seconded the motion, which was carried.

FIRST DAY—AFTERNOON SESSION.

Prof. DEAN, of the Ontario Agricultural College, Guelph, on the Convention resuming, was introduced, and delivered the following address upon

CREAM-GATHERING *vs.* SEPARATING CREAMERIES.

One thing, I think, is lacking at our meeting of the Creameries' Association. I think there should be a good representation of the ladies, because they are as much interested in this butter question as the men, if not more so, and in my opinion the men are to be blamed for not bringing them out.

My subject this afternoon is that of "Cream-Gathering *vs.* Separating Creameries: the advantages and disadvantages of each." In the Province of Ontario our summer creameries are mostly conducted on the cream-gathering system. Especially in the western part of the province, the cream-gathering creameries are more numerous than the separator creameries. In fact, the separator is new. Is it advisable to have a change? Is it possible to have a change? I can say that a great many patrons of the cream-gathering creameries are dissatisfied. I know that, because my work takes me among the farmers of the province, and there are a great many complaints as to the way in which our cream-gathering creameries are carried on. Can this be improved in any way? Unless the owner of the creamery has the confidence of his patrons, I am satisfied he cannot succeed. If I were asked what is one requisite for a successful creamery, I would say that the management possess the confidence of the patrons. If it does not possess their confidence, the creamery will go to the wall as sure as any-

thing. Now, I think one reason for a lack of confidence is that the patrons have begun to talk among themselves, and to say that the testing has not been done properly, and, when that goes on, it will not be long before there will be a change of management, or the creamery goes under altogether.

The first American butter factory was built by a Mr. A. Slaughter, at Goshen, Orange County, N.Y. It was run on what they called the "pail and pool" system. This system was worked somewhat as follows: If possible, the factory was erected over a spring. The milk was hauled to the factory and set in pails into this spring water. In places where they could not build the factory over a spring, the water was brought in pipes to the factory. A man named Wellard claimed to have first brought this before the public in Orange County. The milk was placed in cans and submerged in the water. The cooler system is one of the oldest deep-setting methods we have in America.

Another system brought forward about the same time was called the "Dake" system. That was introduced in Ohio, and was first used in the manufacture of cheese. Instead of bringing the milk, the curds were collected from the patrons and brought to the factory, where they were manufactured into cheese. This system was not a success. It was afterwards applied to butter. Fresh butter was gathered from the farmers, and, on being taken to the factory, was put into a vat holding from 400 to 1,000 lb. Here it was cut with a wooden ladle into small pieces and moderately cold water poured over it. A wooden hoe was then used to hoe it from one end of the vat to the other to temper it. The butter was taken from this and put through two machines. The first was a machine of a sieve-like nature, which cut it into fine lumps. If coloring or salt were needed, they were added before the butter was put through machine No. 2. This machine was supposed to distribute the coloring and salt, and work out all the brine and butter-milk. This system was considered a great improvement on the common system of butter-making at that time, but you can understand that at present such a system would not last very long.

Now, as to the advantages of the creamery system, the first I would mention, and, perhaps, the strongest, is that you are able to gather from a large area of country. A prominent creamery man said to me on the train last night that the only limit which he allowed for a team was as far as it could go and get back in a day and live through it. Of course that system has its disadvantages in a rough country and where the patrons are far apart. During the month of September I spent about three weeks in the county of Grey, where, perhaps, there are more creameries than in any other part of the province. From my experience there, I think separator creameries could not be worked satisfactorily in any part of the country where I have been. The farmers live long distances apart, have a herd of four to five cows on 100 acres, and there are rough roads. When I speak of advantages of the cream-gathering system, you will see that the cost of hauling would be so great under these conditions, that the separator system could not be carried out successfully. In a section like that there is an advantage in the cream-gathering system, and what I have mentioned are, perhaps, the strongest arguments in favor of the cream gathering system.

The second advantage which may be mentioned for the cream-gathering system, therefore, is the cost of hauling. The cost is much less to haul cream for 1,000 lb. of butter per day than it is to haul the whole milk to be separated at the creamery and then take the skim-milk back again to the patron.

The third advantage that may be mentioned is that the skim-milk may be left at the farm for the patron to make what use of he likes.

The fourth advantage—and this, perhaps, some of you will question—is that the butter may keep a little bit better on the cream gathering system. I have talked with a number about this and I have had some experience of my own during the last summer in this connection. I think just after the separator butter is made it is perhaps a little better than butter obtained from cream raised by gravity methods.

Now, one of the disadvantages of the cream-gathering system is that patrons are grumbling a good deal about the test. If you have heard the grumbling from patrons that I have on this point you will think that there is need of a remedy. A man said to me last summer, "Why, one day my cream tested 150, and the next day it was down to

80 per cent.; I would like to know if that is honest and square?" That is a common experience. At many Farmers' Institutes this subject has been discussed, and a great many patrons are dissatisfied on this point. Now, what is the reason that the test varies from day to day? I think there are about four or five reasons. What I think the most common one is that different persons do the skimming. For instance, a farmer's wife does it as a rule. Possibly she wants a holiday and leaves the paid girl to do it. Perhaps the hired girl's young man is coming around that very evening, and she gets in a hurry and runs in a lot of skimmed milk with the cream. As a consequence the test goes down to 80 and the next time the patron gets a statement he swears that he will never give another pint of cream to the creamery, because he thinks the test has not been properly made. At a meeting of patrons of one creamery which I attended last fall I found that the driver used to take a sample out of one can of a patron's cream whereas the patron had three or four cans. You know that cream varies very much, and that the test of a sample from one lot of cream might not be the same as from the others. It is possible that the driver might take a sample out of a rich crock of cream and the other two or three crocks might not run so high. A sample should be taken from each. That is one way to ensure a more uniform test and cause less grumbling among patrons.

Another cause for dissatisfaction is the churning not being properly done. In cases where the samples are not properly ripened there will be a variation, and in some instances the reading may not be done as carefully as it might be.

Now, I think, those four things will account for a great deal of the variation in the tests of cream at our cream-gathering creameries, and if those four points were observed more closely we would have less grumbling among the patrons

For another thing, I do not think the test of cream taken from shallow pans shows its true value. I believe it would pay the great majority of creameries to refuse to take cream from shallow pans. At one creamery where they had grumbling among the patrons the driver told me that a number of the patrons on his route sent shallow pan cream, and a portion of it was thick and humpy. I think there will probably be trouble where the patrons send thick cream like that. That is one trouble about the cream-gathering system, because the butter-maker has not got control of the cream. Of course with the separator system he has control of the cream from the time it comes from the milk, and any one knows that unless he gets good cream he cannot make good butter. It is the duty of the patron to see that the butter-maker gets good cream and then to see that it is made up in the best way.

But the greatest disadvantage and the one I wish to emphasize most is that there is a great loss of butter to the patrons of the cream-gathering creamery. In connection with our travelling dairy we have tested a great many samples of skimmed milk, and the fat left in it would run from a trace to 3 per cent. One patron brought in a sample of his whole milk, which tested 4 per cent., and the skimmed milk showed $2\frac{1}{2}$ per cent., so that he was losing over half the butter in the skimmed milk. I think there are a great many cream-gathering patrons having just as great losses as that.

I want to refer here to some experiments we have been carrying on during the past year, from May to October. I have here the average loss per thousand lb. of milk by the separator, deep setting and shallow pan methods. To show the losses under each system I call your attention to these figures:

Loss of Fat per 1,000 lb. of Milk by

——	Separator.	Deep-setting.	Shallow pan.
May	.00	1.54	3.39
June	.00	1.66	2.83
July	.25	1.65	3.50
August	.24	1.04	2.44
September	.24	1.81	3.70
October	.84	1.03	1.80
Average loss per 1,000 lb	.26	1.45	2.94

You will see that in these experiments, even by the separator method, there was a much larger loss in one month (October) than in the other months. We have a good, careful butter-maker, and when he read to me the result, I said to him, "How is it that in October you have a loss of .84 per 1,000?" He did not know. That shows you that even with the separator there may be greater losses than there is any necessity for. I think probably the separator was not working properly, or that the butter-maker was running too much milk through it. You see, the average loss by the deep-setting was six times greater in round numbers than by the separator, and the average loss in the shallow pans was about twice as great as in the case of the deep-setting. Now, perhaps that does not seem to be very much, but the loss of $1\frac{1}{2}$ lb. of butter per 1,000 lb. of milk to a creamery handling 10,000 lb. of milk per day in a season of 200 days, would amount to about 600 lb. in the case of deep-setting with the very best of conditions. I am satisfied that the loss on the average farm is at least twice as great, and I think that a very moderate estimate. That would mean in two hundred days a loss of $1,200, and in the case of the shallow pans it would be double that.

There is another thing which some patrons cannot understand. They say the creamery men tell them that they should not work for a high test, and yet there are some who will do almost any thing to get a high test. A farmer who has an average of cream of 80 to 100 per cent may be making more money than one who has 100 to 150 per cent. Why is that? If the milk is set under proper conditions we will get more cream than if it is not so set. I am satisfied that if we are going to get anything like good results we must have the cream set in water at a temperature of 45°. Why? When you set milk in very cold water the cream is thrown up rapidly and carries with it a considerable quantity of skimmed milk, although when it is allowed to stand for a lengthened period a proportion of this skimmed milk settles down again. To show what the increase would be by leaving the milk stand twelve, twenty-four and thirty-six hours, I made nine trials, with the following results:

Inches of Cream on Deep Pails at

——	12 hours.	24 hours.	36 hours.
1st trial	$3\frac{1}{8}$	$2\frac{7}{8}$	$2\frac{5}{8}$
2nd "	$3\frac{2}{8}$	3	$2\frac{4}{8}$
3rd "	$4\frac{1}{8}$	.....	.....
4th "	$3\frac{6}{8}$	$3\frac{3}{8}$	.....
5th "	$2\frac{5}{8}$	$2\frac{2}{8}$	$2\frac{3}{16}$
6th "	$3\frac{1}{8}$	$3\frac{4}{8}$	$3\frac{2}{8}$
7th "	$2\frac{4}{8}$	$2\frac{2}{8}$	$2\frac{2}{8}$
8th "	$3\frac{4}{8}$	$3\frac{2}{8}$	$3\frac{2}{8}$
9th "	$3\frac{3}{8}$	$3\frac{1}{8}$	.....
Average inches in eight trials	3.22	2.98	$2.8\frac{1}{8}$

You see there was less cream at the end of twenty-four hours than at the end of twelve hours, and less at the end of thirty-six hours than at the end of twenty-four hours. The simple explanation of that fact, as I have said, is that when milk is put into very cold water, it throws up a very large quantity of skimmed milk with the cream. When allowed to stand twelve hours longer this skimmed milk settles down again, and as a consequence there are less inches of cream. The average decrease in an ordinary shot-gun can is about one-quarter of an inch in the first twelve hours, and one-eighth in the second twelve hours. Now, notice the difference of the samples in the first column. The milk varied all the way from four and one-eighth to two and three-eighths; and yet some people will tell us there is no difference in milk. Others judge their cows by the number of inches of cream. That is a poor way to judge. There are so many contingencies that affect the number of inches of cream that it is unwise to judge a cow by that standard. Some cows' milk will cream a great deal more quickly than others. For instance, I have tested a sample of cow's milk in which there was over two per cent. of fat left in the skimmed milk. The milk of another cow set for the same time, and under the same conditions, showed less than one-tenth of one per cent. of fat in the skimmed milk.

Now we come to speak to the advantages of the separator method. The first is that practically all the cream is obtained—that is if the machine is properly run.

The second advantage is that the milk may be tested with certainty. Under this system we have a machine that gives exactly the relative value of each man's milk, and where we can test the milk with certainty there will be no reason for patrons grumbling, for the proceeds of the milk may be divided equitably. It is not necessary to test the samples even once a week. From experiments we have carried on during the past season, we know that once a month is often enough. By the use of bichromate of potassium we have kept samples perfectly for seven weeks in hot weather; so that I am satisfied composite samples can be kept for one month. But the sample jars must be looked after and kept clean I was in one factory where the samples contained blue mould at the end of one week. They could not have been kept clean or they would not have been in that condition.

[For details of composite testing once a month see Report of Western Dairy Association.]

Now, for some of the disadvantages of the separator method, and the first is the cost of hauling the milk to the factory and the skimmed milk home again. That is the great bugbear in connection with the separator system; and the subject of good roads is very closely connected with the question of separator creameries. They are very closely bound together, and if we had good roads in the country we could have more separator creameries and make more money than at the present time. I am glad to notice that in the newest creameries nearly all have separators, and I think the time will come when the separator creamery will be more largely adopted than at present. Another disadvantage is the difficulty of getting the skimmed milk back to the patrons sweet. A great many want their skimmed milk to raise calves. When we had the separator creamery at Guelph, I told the patrons that if they would send their milk to us sweet and in good condition, we would send it back to them sweet. The great difficulty we found was that when the milk ran up to 80 or 85° it would sour in a very short time. If it had come to us perfectly sweet we could have sent it back sweet. As to how this milk may be treated, I think I know of no practical method at present, except heating to 160 or 170°, and cooling again to 40 or 50°.

Another disadvantage of the separator method is the extra cost of outfit. It costs more than a cream gathering creamery, and the chief item of expense is the separator itself.

Some of you may be ready to ask me what is the best kind of a separator. I do not know, but I will tell you what I think is the best—the separator that will skim the most cream at the least cost, with a minimum amount of labor, and leave a minimum amount of butter in the skimmed milk. We have five different kinds of separators at the Dairy School, viz.: The Alexandria, Danish Weston, United States, Alpha and Russian. Students may choose which they find best.

Now let us look at what is the best method of carrying on a creamery. I have spoken of the advantages and disadvantages of the two systems. In some localities I am satisfied the separator method cannot be successfully carried on. What I would suggest under such circumstances is that separators should be put in at separating stations for the benefit of those who live near by, and to which they could haul their milk at a minimum cost. After being separated at these stations the cream could be taken on to the central factory to be made up, and the skimmed milk returned to the patrons. When patrons of cream-gathering factories saw the extra amount of butter and money which these men were getting, they would want a separator for their creamery also. (Applause.)

Mr. John Hannah, Seaforth: I have listened with a great deal of pleasure to Prof. Dean's address on this subject, with which I am tolerably well acquainted, having been running a cream-gathering creamery and skimming stations where the milk is skimmed by separator. With regard to the complaints among farmers as to the testing system in the gathered cream, I think we are still going to have trouble, whatever system we adopt—that is if we are going to pay one man a little more than another. Although we found a great many complaints with the aid of the test, in my own experience I have found very little real difficulty; and at the annual meeting of the patrons a little mutual explanation

generally cures nearly all the trouble. In the cases which the Professor has mentioned there is room for a great deal of variation without any dishonest intention on the part of the patrons or the butter-maker or any one else, and when these matters are explained frankly we do not have much difficulty. For instance, in the example which Prof. Dean gave us, where the cream dropped from 150 to 80 per cent. from one day to another, the patron is sure to be dissatisfied; but after explaning all the conditions you can convince all those except the party making the complaint if you cannot even convince him. When the skimming is done by different persons, one of whom does it carefully and another carelessly, it is quite possible that there may be difference of a quarter to half an inch in the showing of cream. Then, again, when you come to take a sample, perhaps the patron has not followed the instructions very carefully about setting, and you will find that the cream is richest on the top of the can. Then, the maker, when he gets the cream to the factory, may allow it to stand a considerable time before putting a sample into his test bottle and he may have struck through the rich cream on top to the really poor cream below. Of course I hold that the butter-maker should see that every sample is thoroughly churned. It is a matter which he can see at once. If it is thoroughly churned there is a solid oil, but if it is not, then there will be air bubbles. Just the difference of a hair's breadth on the tester may throw the test out 10 per cent. one way or the other, and so if the test is not carefully made the cream may go up one day and down the next. Of course the law of averages will hold good, and if the test is low one day it is not likely to be the next. There were three or four patrons at my creamery who were dissatisfied and dropped out for a season, some for two seasons, but I do not know of one but is back to-day. They come back again when they see that there are men running the creamery in whom they have confidence, and these are the things that help us out. We will have the same difficulties with the Babcock test. I have been testing for the past two years with the Babcock and have had a good many complaints. There is not the same room for variation in the whole milk as in the cream. We get cream from open pans which have been set in almost any temperature. You can see there is room for variation of such cream, which there is not when the milk is separated at the factory. With regard to the separator, I can agree with nearly everything the Professor said. The advantage is just in having the article that is to make the butter more under the control of the butter-maker. With the cream gathering system he does not get control of it so early. He gets such variations as to make it hard to handle so as to make a really good article. When everything is favorable, however, I think it is possible to get a really good butter from gathered cream; but there is just that difficulty of getting the proper quality of cream all the time. In regard to the disadvantage of hauling the milk to the separator, it is a great drawback in a country where we require the skimmed milk, and where we are breeding steers for the Old Country and breeding horses. Then, it is difficult in many sections to get a sufficient quantity of milk within a reasonable distance to make the separator system pay. Where there are only four or five cows in a herd we have to go a long way in order to get enough milk. All our roads are good enough for the cream gathering system, but we cannot undertake to haul our milk so far as it would be necessary to do for a separator factory. I have started a skimming station to overcome this difficulty and we are doing fairly well. Of course that is an advantage of running a large factory and handling a large quantity of milk, but I think it would be better if the churning could be done at the separator factory. In regard to returning the skimmed milk sweet to the patrons, during the past season I have had the skim-milk heated to 160 or 170 degrees immediately after coming from the separator. We do this by means of the exhaust steam which is turned into the vat, and we have no difficulty in heating the milk as it comes from the separator. Some of the patrons come 8 miles and take their skimmed milk back 8 miles and their skimmed milk is sweet enough to feed to their calves on being taken home again, though of course it would not keep until the next morning. The patrons were well satisfied with this plan. One thing which perhaps made them satisfied was that there was a good deal of complaint, and reason for complaint the previous year.

Mr. M. Moyer, Toronto: I see by Prof. Dean's figures that in the May test the loss of butter-fat in the skimmed milk, with the shallow pans, was considerably more than in the next month, and is then higher again, and then lower. I also see in the first column, that with the separator the loss increased to October. What could be the cause of that? Prof. Dean said that perhaps there might have been something wrong with the machine. Suppose you were to run thorough the machine skimmed milk without any fat at all it would still throw out some percentage of milk where the cream should come. The openings for the cream are still left open, and, if there is no cream, milk will come where cream should come.

The President: No. If there is no cream in the milk you cannot get cream out of it, and the milk will all run out of the skimmed milk spout.

Mr. Moyer: I thought that, as the milk contains more fat in the early part of the season, when the cows are fresh, than it does later on, the machine should have been charged so as to allow less cream to run through.

The President: There is no doubt the October test was not a proper test for the separator, because they no doubt allowed too large a quantity of milk to be put through at once. They should not have run through so much as in May, because there was a great deal more butter in the milk in October than in May.

Mr. Moyer: Suppose you run two qualities of milk through the separator, one after the other, will you get all the cream out, without altering the machine?

The President: The machine will throw out all the cream that is in the milk.

Mr. Sprague: You say that the machine worked properly only in May and June?

The President: That is what I claim.

Mr. W. G. Walton, Hamilton: You will find that nearly all the separators now in use in Canada, have to be adjusted to suit the different samples of cream from one month to another. I am speaking now of the Laval. I do not know so much about the others.

The President: I would like to ask the Professor if he thinks in a section where the patrons are not so thickly located that they could have a separator creamery, the skimming station system would not be the practical thing for the country. That is, to haveing a central factory with skimming stations round about at one point and another, say six miles from the central factory?

Prof. Dean: I know of one gentleman who has been using two skimming stations. He thought if he could get enough milk he would rather handle the whole of the milk at the factory.

The President: But where you have not got enough milk don't you think this plan has been satisfactory?

Mr. Hannah: I tried that, but did not altogether satisfy myself. You have got to find out from practical experience whether in your own circumstances it is going to pay or not. One thing I am very glad of is that there are separator agents here. No doubt the manufacturers fix the prices, but the agents can represent to them that until they get their separators down a little cheaper there is going to be some difficulty in starting that system. If you pay $500 or $600 for a factory building you might about as well go to the expense of getting the extra machinery. My opinion is that for the sake of the extra expense you might just as well hold off a little and get your whole factory complete. But it is a little difficult to get in enough milk for a separator. Take my Seaforth factory, I could put in five or six separators, all within reasonable teaming distance, but that means a very large outlay for all the available business. I feel satisfied, however, that if we could get the separators at fairly reasonable prices we could run these skimming stations all right.

Mr. John Boyd, Chicago: We have nothing of that kind in Illinois. All our factories in the section where I live are well supplied with milk. I would like to ask Prof. Dean a question. He spoke about the difficulty of making a correct test. He mentioned several contingencies in connection with that test. I would like to ask if he ever tried the same test with cream as with milk.

Prof. DEAN: Yes, we have tried it. You can test the cream all right if you can get a proper sample of it in the pipette.

Mr. BOYD: We would not take any cream from open setting at all. Of course I can see how you can eliminate two of those contingencies. In the first place you avoid the contingency of churning and of reducing it before churning. Of course you could not use the same bottles with the oil test for the cream that you would for the milk. You would have to have a bottle suited to that purpose. You would need to have a bottle with a wider scale.

Prof. DEAN: The bottle is the bulbus necked bottle graded up to 25 per cent. We found it work very well. Then there is another bottle, recently out, with a detachable neck. You slip on the neck, add hot water, and it reads up to 25 or 30 per cent. The difficulty with the Babcock test is to get a proper sample and then to measure it accurately.

HOW TO IMPROVE THE QUALITY OF OUR CREAMERY BUTTER.

Mr. JOHN CROIL, of Aultsville, read the following paper:

To secure the highest price for our creamery butter, I think you will all agree with me, should be the object of the Creameries' Association. This can only be done by improving the quality and securing the best markets for it. I take it for granted that it is now an established fact that the only successful system of carrying on the butter industry in Canada is by the co operative or creamery system, and anything that may be done to further the interests of the old fashioned home dairy is only an injury to the butter industry. I could never see the sense of sending the travelling dairy waggon through a section of country covered with cheese factories and creameries. We had difficulty enough in getting the farmers to combine together without having inducements thrown out just when we got them right, to go back to the old system.

There are two ways by which we can improve the quality of our creamery butter: (1) By more care being taken with the milk by the farmers and by more skill and care in the manufacturing of the butter. (2) By placing the butter in the hands of the consumer when fresh and in its finest condition.

While much can be said and remains to be done so far as the care of the milk and the manufacturing and care of the butter is concerned, I do not intend to try to teach any of our butter manufacturers on these points. I came here more to learn that part of the business, and I will leave this in the hands of our instructor and others who are more competent to give you information in this matter. I will, however, just say that there is plenty of room for any amount of work on this line, as I am informed by the principal dealers in the City of Montreal who handle large quantities of creamery butter and who supply the finest trade, that not more than twenty-five per cent of the creamery butter made in Canada will suit their best customers. The balance is usually sold for export and sent to England. Fine goods are these to establish a record with, and much use is there in looking for fancy prices from that quarter.

Now, I think something should be done by this Association to assist our butter manufacturers to get their butter on the market when it is fresh, and the manufacturers should do what they can to encourage the trade for fresh-made butter. There are many things to be said in favor of selling butter as soon as possible after it leaves the churn. It is then in as perfect condition as possible to get it and in this condition the consumption is much greater than if held any length of time, the buyer is sure to want more of just the same kind; there is no loss from shrinkage in weight which there will be if held, nor is there the chance of butter going off flavor, etc., and there is also the advantage of being able to give quick returns to the farmers for their milk. Strictly fresh made butter is always worth, for the best trade, at least two cents per pound more than if held until it has lost its fresh flavor, and it is very rarely that this can be made by holding it, from the advance in the market. So far as the Canadian trade is concerned, we can easily secure it, and I am satisfied that the demand for fancy fresh-made creamery butter is growing very fast for our home trade.

On account of the scarcity of dairy butter last season many of our small towns were obliged to take creamery, and just as soon as the consumers found the difference in quality they were only too glad to pay the extra price. I think the day is not far distant when our home trade will be satisfied with nothing less than the finest creamery butter. The best dairy butter to-day has to submit to a reduction of fully five cents per pound from the best creamery.

Every care must be taken to have our butter put up with the most attractive appearance. Taking into consideration the value of butter, I know of no article of food that is so slovenly and carelessly put up for the market. Look at the style of a bottle of whiskey or can of tobacco and compare it with the butter on our markets, and is it any wonder the number of people who prefer the former? The one has everything about its outward appearance so far as style and cleanliness go—everything to make it attractive, and the other is all the reverse.

As we cannot depend on selling all of our butter in Canada when fresh and England and Scotland seem to be the most profitable markets for us to look to for the balance, is it not likely they want the same butter as we do to eat? Have we been giving them this or are we trying to do so? I say we are not, and some determined attempt should be made by our butter manufacturers to have our finest grass made, high flavored, mild cured, Canadian creamery butter introduced on their markets. We persisted in giving them dairy or home-made butter when they were getting the finest creamery from other countries, and then we pushed our stale and off-flavored creamery to them and now they are getting a taste of the tail ends of the milk flavored with the stable from our winter creameries. Is it any wonder that they do not want our butter at a high price and that an extra effort will have to be made to secure this trade. It is nonsense to any one acquainted with the butter trade to compare the bulk of the stuff they have had with our fine delicate flavored grass made creamery. To get this trade we must have some of the very finest butter made in the world, and we make it right here in Canada, shipped weekly to their market and placed on arrival there on the consumers' table no matter what the cost may be. They will then learn that they can get what they want for their best trade from us and you will not see a difference of 20 per cent. or 5c. per lb. in the price of Danish and Canadian butter. By doing this we will not only secure a better market for our surplus summer creamery, but also establish a record for finest butter and help the sale of our winter creamery butter. I hope this Association will not let another season pass without doing something in this direction.

Mr. CROIL: I would like to ask Prof. Dean what he considers the difference in the feeding values of sweet and sour milk? We fed some sour milk this year ourselves, and got better results than from feeding it sweet. I do not say that sour milk is better, but we had no trouble at all in getting it sour and a good deal of trouble in keeping it sweet. (Laughter).

Mr. PEARCE: Were you breeding calves?

Mr. CROIL: Yes, calves and pigs.

The PRESIDENT: The fattening quality in the milk is the sugar, which you have when the milk is sweet, and the minute the sugar is gone the full value of the milk is gone.

SELECTION AND CARE OF THE DAIRY COW.

Mr. W. G. WALTON, of Hamilton, read the following paper:—It seems to me that our worthy president keeps a constant supply of speakers on tap, and all he has to do when he wants one is to turn the lever. I did not know until I saw this programme a few days ago that I was down for a paper, but I remember once telling him that I was always at his disposal, and perhaps this is why he did not consult me. However, as I have always had a deep interest in this creamery business, it will please me if I can help any person or institution that will advance it in our country. The inspiration that the World's Fair must have given all of us should intensify our interests in dairying.

Why, you know we took almost all the awards, and Prof. Robertson is going to tell us why we did not take them all. If France, Denmark, Ireland and all the world had competed with some of our exhibits, we would have defeated them just the same. My recent travels in the Old Country have awakened in me new ideas, in seeing the way butter-making is carried on over there. To me the opening in Ontario looks brighter than ever. I am sure nature has provided us with many advantages, and as our people have greater enterprise, push and determination than they have, success seems sure for us. This is not on the line of what my paper calls for, but I just mention it that it may help to inspire you.

"Selection and care of the Dairy Cow," is, I believe, what I am to talk about, and I assure you that I feel highly honored to think our President should call on me to "Tussle" with a subject that is above all the most important branch of the dairy industry. It is right here that the success (or may I say the downfall) of the Dairy farmer depends, and if he succeeds and makes money, the creamery men, business men, manufacturers and all will do well. So you see here lies our motive power to bring successful dairying to its highest standard.

First, The selection of a Dairy Cow. Up to the present time this would depend on whether she was wanted for a large milker, for shipping to a city, for cheese factory purposes or for a butter cow. There is not much trouble in selecting a large milker, but as the time has come when the quantity of butter-fat is the basis of future dairying, it is not so easy to select a large fat-giving cow. Of course there are certain rules to use in the selection of a butter cow, as well as for a large milker, but we are more often deceived in the case of the butter cow. On the islands of Jersey and Guernsey, where I spent considerabe time last summer, I found they had as complete a set of rules for selecting a butter cow, or perfect cow, as could be made. But I have come to the conclusion that to get those perfect butter cows we must each breed our own no matter what breed we may select.

When we go out to buy cows, the seller will not let us have his best if he knows it, but the contrary. So if you have one or more good butter cows, breed them to the progeny of great butter record cows, and by careful breeding you can soon have a whole herd of good butter makers. Any others do not pay. In most of the Jersey breed, we can get the fat giving qualities, but we want large milk producers as well, and we may have in some cases to cross with other breeds to accomplish this, but not always, as it can be had in the pure Jersey alone, as well as some other breeds.

I think if dairymen would introduce some good Jersey blood into their herds it would improve our butter, as well as increase the quantity of fat. I know we can get a firmer grain of butter from Jerseys than from any breed, and I find that where they are mostly used the butter will stand a greater heat, with very few exceptions, where equal care is used in making. I noticed this particularly in England; also in butter from different parts of Ireland, Denmark and France. You know this is very important for the dairymen of Ontario to know and practice, for our butter would then reach the English market with a much better grain. I imagine I can see some smile, thinking I am favoring the Jersey breed, but if any one will take the trouble to investigate the matter, as I have done he will find this to be correct. I am aware you will get this firmness in individual cows of any breed, but more rare than in the Jersey.

I wish we could get for this Convention one pint of milk from each cow in a herd of 50 Jerseys and also from 50 of any other breed or mixed breed, and put those samples into that number of quart jars to sour and churn, and have the butter from each individual cow in separate dishes before us. We would find every shade from snow white to a dark yellow, and the grain, firmness and flavor would surprise you. But still I think you would not get over ten per cent. of objectionable samples in the Jerseys, while in other breeds there would be more. This testing of individual cows in herds should be practiced by every farmer, because then he would know what cows were paying and those that were a loss to him, so that he might as soon as possible dispose of the unprofitable ones. This testing applies to the quantity as well as quality. I find many cows do not pay their keep in the quantity of butter-fat they give. I would not put so much im-

portance on this testing if we could go out and buy all the cows we wanted with large udder, large crooked milk veins, small thin neck, straight back, long thin tail, withers fine, tapering and flat, deep through the chest, fine bone, large arm, yellow skin, soft hair, a gentle eye, tapering head, crumpled yellow horn etc., because we could almost be certain of a good cow from those indications. But when we find so very small a percentage of this kind, we must breed them from selected stock, which have been tested, and then they can only be produced by the most careful breeding.

I went out a short time ago, to buy a car load of fresh milkers. I had a Babcock tester with me, and, out of 47 samples, I only found two extra good, ten fair. The first two showed 8.20 per cent.fat,other ten ran from 4½ to 6½ and one showed 1.80 which I also bought to make some experiments with and paid a big price for her. The results I will perhaps give next year should we meet again. None of this lot was what I desired, and I will venture to say that there is not over one cow in every 100 in Ontario that is up to a standard of perfection that we could not bring all our cows up to or even surpass. I wonder how long it would take to bring our cows up to a very high standard if every farmer had a Babcock tester and a pair of scales and only bred from the very best and continued to do so with as much earnestness as some of our trotting stock breeders over the lines are doing to get the record down ½, ¼, or $\frac{1}{10}$ of a second on a mile every year or so. What an achievement we could attain if we were all alike determined and united in this line of breeding. It is quite possible that Ontario could ship three times as much cheese and butter from the same number of cows as is now being done. Just think of us exporting 30 to 40 million dollars' worth annually, instead of 13 millions, now being shipped, from the same number of cows! Our President at Peterborough a few days ago referred to two farmers sending to the same factory in his vicinity—one netted $20 per cow, the other $60.

I have been running continuous dairying, that is, all the year round, about same in winter as summer, for twenty years, and I know quite a number of farmers that I have paid from $90 to $100 per cow. I have one man in my mind now, who kept 18 to 20 cows and I always paid him for his milk about $150 per month, or $1,800 per annum, and many other farmers similar accounts. Ex-Gov. Hoard tells about a "scrub" farmer (as he calls him) saying he would not subscribe for his paper because Mr. Hoard told too many lies about making $90 per head per year out of cows.

Now, the next thing is to care for those good cows after we get them. We should have good stables made out of stone, brick or wood, above ground and under the barn where the temperature in winter can be kept from 50° to 60° or as near 60° as possible, well ventilated and well lighted, with ceilings 9 feet or over in height. Give them a variety of good food, corn in different forms being the best as the principal food. Keep dry and clean, curry off once a day at least. Give them plenty of good water pumped through pipes from a distant well or spring into the stable, by means of a tread-power, and instead of turning the cows out to be chilled (as they will only walk to the trough and take no further exercise), put each pair of cows in rotation on tread power to pump, or cut their own feed. Arrange it so that, apart from the walk to the trough in the stables to drink each day, their turn would be say 2 or 3 times per week, for ½ an hour exercise on the tread power.

This turning out cows in winter where good stables are used is all wrong, as no good can ever come from it, and, in many cases a great loss. If they were taken out to drink and returned at once I can see no particular objection, but 99 times in a 100 they are left out too long and get chilled.

Almost every farmer will tell you it is a good thing to turn his cows out to drink, as they require exercise. Did any of you ever watch a lot of good milking cows turned out to get water on a cold day or any day in winter, say where the water trough is 50 to 200 feet from the barn, and see how much exercise they get? I never saw them take any exercise further than to the water. A few will monopolize the water trough, drink all they can and stand and get thoroughly chilled, while some of the weaker ones have to stand back and wait until they are chilled before they get a chance to drink and then fill

up till they are satisfied. It will take them hours to resume a normal temperature after returning to the stable. Some of you have seen this and know it to be so. Any of you who have ever run a large winter dairy must surely have seen the falling off in quantity of milk from this practice. Uniform temperature will alone give the largest flow of milk and the most uniform quantity of butter-fat. Use your cows with the utmost kindness. Make every one a pet if possible.

A great many people think you have to put everything through a cow's stomach to get good milk and lots of it. Just try kind treatment and see the results.

I once went into a stable where a man was milking. He had taken a fork handle to a cow for going into her wrong stall, and when he started to milk her, because she would not let her milk down with the usual freedom, he took the fork to her again. I often wished I could have had the time to test that sample of milk with her previous milking. Of course we know from many experiments made in this line, what we would expect in that case. I will not mention where this occurred because some one might be here from the same county and I do not wish to disgrace the county. (Applause).

Mr. Walton added that before another Convention he hoped to complete an invention which he was working upon in the shape of a self-acting ventilator by means of which an even temperature would be maintained in the stables during the winter months.

The PRESIDENT: We boast about being leaders of the world in the manufacture of cheese and butter. We boast about how far ahead of our neighbors we have advanced, and yet, when we come down to the facts, we find that we are only getting $30 from a cow per year. Does it not really strike you at once that we are not doing what we ought to do and that we are not setting the example to our neighbors which we should. If we select the proper cow the whole problem is solved. We can send twice the quantity of butter to the factory that we are doing. If we did this we would have twice the amount of money to circulate and every factory would hum in consequence. How can you expect to make money if you take a fork handle and pound a few of your cows and feed them on rye straw and turn them out to freeze to death? You are never going to make money in that way. You must have a proper cow, give her proper care and proper feed. In this way we can put ourselves in the right position; in this way we can make ourselves felt throughout the world; in this way we ought to be trying to do something for ourselves and families, putting ourselves in every possible way in an influential position. We ought to do it for patriotism's sake—for the good of our country—for the sake of our good name. Now, I know after what we have heard that not one single man will go home from this Convention and guess at the product of a cow that has starved him and his family all the time he has kept her. Take the scales and the Babcock test and see what she is doing. See whether she recompenses you for all the food she receives and whether the product she is making yields a profit to you.

Hon. Mr. READ: I would like to ask the gentleman where we are going to get this cow that is going to treble our exertions? I have been looking for that cow for a great number of years and I have never had anyone yet tell me how to breed her. I have been breeding cows for the past ten or twelve years—up to that time I purchased them. I think I bettered myself by breeding them, yet only four out of a dozen answered my purpose when I came to make milkers of them. This gentleman has been talking of butter cows. We are just milk producers and require cows for that purpose. Quantity has been our motto. I fancy he has a great favor for the Jerseys. Are they the cows for us to keep? I am here to find out. I have kept forty to sixty cows for the last ten years and find very few that satisfy me. I would ask the gentleman if it is the Jersey he recommends?

Mr. WALTON: If you notice in that paper I refer to the future dairy on the butter fat basis. I think quite a few factories have already adopted that basis, and we know nearly what cheese factories and butter factories have adopted it. Now, if our country

is going to be lionized as a dairy country why not use the Jersey as a fat producer? If we can get a combination that will produce the fat and then give us the quantity too, we have the cows that are wanted.

Mr. ASHLEY: Did not the Jerseys beat everything at the World's Fair, both in cheese and butter?

The PRESIDENT: Yes, they did.

Mr. WALTON: I say it may be necessary to cross in some cases, in order to get a good start in dairy cows. You cannot buy the dairy cows, because men are not likely to sell their best milkers. You have to get them by breeding.

Mr. GRAHAM: When we get our cheese factories fitted up with the Babcock test Mr. Read and I will go in for butter producers, but until we do we are going to use the cows that will give the most milk. My experience with Jerseys has been that they are not large milkers.

Mr. BOYD: It strikes me that Mr. Read answers his own question better than any one here to-day. He says he has tried for a number of years, but has not succeeded yet in getting cows that satisfy him, but he has not yet tried the Jerseys. The cow that makes the most butter makes the most cheese, and if there is anything that has been demonstrated by the World's Fair it is that fact.

Hon. Mr. READ: My impression is that the Jersey is a tender cow. They never gave enough milk to satisfy me. I may have kept them sometimes. If we go back we find that the Jersey and Guernsey cattle were the original cattle of this country. Hence you will find them in the lower parts of the Dominion and the Jersey is a reasonably good milker and a rich milker, but to my mind, for this part of the country, where the people have not taken that care of their cows which they should do—where they have been allowing them to run around the straw stack—she will not do so well. The general run here has been about seven months' milking, but that is changing, and, I think, changing in the right direction.

Mr. WALTON: I said that here up to the present time, the choice of a breed depended on whether you wanted a large milker for shipping, or for a butter or cheese factory. I think that in most of the factories next year there is going to be a change. It is going to be now the cow which gives the largest amount of fat which will pay best.

The PRESIDENT: If the Senator is selling his milk by weight he wants to keep a cow that will give him two pails of milk, even if there is not half a pound of butter in a thousand pounds of milk. (Laughter).

Hon. Mr. READ: I send milk to the city in winter and I do not care how much butter there is in it; I am going to get the most milk possible.

Mr. JOHN SPRAGUE: This week I was at a man's house—a patron of a factory, where the milk was paid for according to the Babcock test. He showed me that he was paid 60½ cents per hundred for his May milk last year. I was at another man's house that same morning and saw that he was paid 74½ cents per hundred for his milk at the same factory. I said to him "how is it that your cows give milk that will pay a larger percentage than other people's?" He said "I do not know how it is, further than this, when I came into this county (Prince Edward) I brought with me a Jersey cow, and to-day most of my cows are from that mother, although to-day my stock has got away from the original. I think it is thirteen years since I came into the county." I said, "I would like to see your cows." We walked out to the barn and he drove his cattle out. What I learned from this was that thirteen or fourteen years ago he had a cow which was ¾ or ⅔ Jersey and that he bred from this. I am a friend of the Jersey cattle. I am interested in dairy cattle. I have been watching this all along the line, and I have been trying to educate myself and my neighbors along this line, If this man had sold his milk he would not have got the benefit of his rich milk. What I learn from this is that there is something in the breed of cattle. What we want are cows that will give rich milk.

Mr. WHITTON: I can quite understand this sermon about the Jersey cow in regard to butter, but not in regard to the cheese business. I quite agree that we can make a larger quantity of rich milk, but can we improve the quality of cheese if we run this rich milk too far? For instance at the cheese exhibition in Chicago we came out well. I see a great many scored as high as 94 points and some as high as 99½. None reached perfection, but some came very near it. My idea is that we may hurt our cheese; run the thing too far; get our milk a little too rich to make good cheese. We claim the milk is about rich enough now to make fine cheese.

Prof. DEAN: I think there is very little danger of having the milk too rich. I think with milk containing up to 4½ per cent. of fat, the fat may all be incorporated in the cheese.

Mr. J. W. WHEATON, (London): Prof. Dean has suggested that I have carried on some work along this line. I think, as he has suggested, the experiments go to show that 4½ per cent. of the fat can be incorporated in cheese. I have heard of experiments in which more fat had been incorporated; but it was not in the case of normal milk. It was milk to which fat had been added. Our experiments have not been carried on further than with 4½ per cent. milk.

Mr. MOYER: I would like to know whether there is a difference in the quality of cheese made from Jersey milk and the milk of other breeds?

Mr. WHEATON: You refer to the richer and the weaker milk?

Mr. MOYER: Provided it is not skimmed.

Mr. WHEATON: There will be an improvement in the quality of the cheese as well as in the quantity from the richer milk. How much more value the increased per centage of butter-fat would add to the cheese I am not prepared to say.

Mr. MOYER: The butter-fat would be increased and I understand the casein would be increased in the same proportion.

Mr. WHEATON: We have been at a difficulty in making our experiments in this regard, through not being able to get very rich milk. In the experiments carried on by Messrs. Rudlick and Bell, at the Tavistock School, the milk varied from 3 to 4½ per cent. and we are at a difficulty when we get up to talk about 5 or 6 per cent. milk, because we have no such milk to test.

Mr. GRAHAM: These last two years I have been using the Babcock test in my cheese factory—in fact two of them—and we have been able to educate the patrons to take their pay that way. The average of our milk, however, has not been over 3½ per cent. of fat, taking the season through. There is one point in the cheese business we are weak on. Of the factories I have been to this season there has not been one where the inside of the whey vat was not covered with grease. Now, until we can get some system by which we can incorporate all the fat in the cheese we shall not get the best results from the Babcock system. Some experiments might be carried on along that line. With our Government institutions something might be done in that direction. So far I have never seen a factory where they have incorporated all the fat in the cheese.

Mr. ZUFELT: I think that is a matter of impossibility. I do not think there is a man in Canada or any other part of the world who can incorporate all the fat.

Mr. J. A. SPRAGUE: Would there be a larger quantity of fat in the cheese owing to the fact of there being rich milk or poor milk? I do not think so. Of course with the richer milk there would be a danger of leaving more fat in the whey. Experiments have all gone to show this summer that the Babcock method is the only proper one for a cheese factory. The system on which it is based is that a quantity of milk containing one pound of fat should produce the same amount of cheese at any time of the year—that if one pound of fat will make 2½ pounds of cheese in May the same quantity should do so in October. In July and August 1 pound of butter-fat may make 2.75 pounds of cheese. In September and October 1 pound of butter-fat may make 2.85 pounds of cheese. Now, I think that is due to the better condition of the milk during the latter months. All cheese-makers will tell you that it is hard to get all the butter out of the milk in

July and August—because the milk is not in proper condition—owing to improper handling. I think that goes to show the necessity for taking greater care of milk in July and August, which are the two worst months.

Mr. BOYD: I would like to ask what proportion of loss of butter-fat there is in the whey as shown by the Babcock test.

Mr. GRAHAM: I have no figures to show, but I should say it would be about two marks less on the grading scale—about $\frac{1}{2}$ of 1 per cent.

Mr. BOYD: That would be two-tenths?

Mr. GRAHAM: I have seen four-tenths. I have seen as high as 5 per cent. in the white whey. I have seen nearly as much as 15 or 16 per cent. in the leakings after it came from the press. There is a large amount of whey leaves the curd after it is cut in the sinks. I have tested to see whether it would not pay to make this up. In many cases if we could manufacture the white whey—the whey that leaves the vat after the curd is cut—the whey that runs from the cheese press—we would have good results from it. There must be some system by which this butter should be incorporated in the cheese.

Mr. BOYD: Can you say at what temperature the curd was cut when there was this loss in the whey?

Mr. GRAHAM: There was a difference. In gassy curd there is a greater loss than in curd that is not gassy. I could not tell you at what temperature this milk was kept, but I think somewhere between 98° and 100°.

Mr. ZUFELT: I never observed a greater loss than two-tenths of one per cent. Of course with a gassy curd there would be a greater loss.

The PRESIDENT: You should know how high you cook the curd.

Mr. ZUFELT: Generally to about 98°.

Mr. GRAHAM: There is more fat lost from the curd, in my experience, after than before it is cut.

Mr. MCCARGAR: I would like to ask Mr. Zufelt if he does not think the cause of the loss is the way in which the curd is worked. I think what makes the rich whey is the inexperience of cheese-makers and the lack of care in handling the curd, putting it too soon in the racks, using the machinery too soon and using too much steam.

Mr. ZUFELT: I think the cheese-maker has a great deal to do with the loss of the whey by improper handling of the milk. If he goes at it in a rough way he is almost sure to set loose a proportion of the cheese.

Mr. WHITTON: I claim that the butter-makers have the advantage over the cheese-makers. They can get practically all the fat, and after the most careful manipulation in cheese-making I have tested the whey time and again by the Babcock test and never found it to show less than two tenths of one per cent.

Mr. JOHN A. SPRAGUE: As dairymen we hold that the question of breed is worth tackling. The Jerseys give the richest milk and gave the most milk in the test at Chicago. But the discussion has led as to whether the fat can be incorporated in the cheese. I believe it can be incorporated. In October we found it would yield 12 lb. of cheese to 100 lb. of milk. In June we found it did not give more than 9 pounds to the 100. I am sure we could double the product of butter if we were all convinced of this one thing—the necessity for breeding better dairy cows. It would be utterly impossible for us all to dispose of our grade cows. Consequently we would have to adapt ourselves to our circumstances. I think if we would breed properly from the best cows we have on hand we could double the output we have to-day. I think the majority of dairymen do not breed the cows, and without this you cannot expect to get so much butter from them. The generality of the dairymen of this country, it seems to me, want to see how little they can get out of a herd. My idea would be to improve the quality of the cows you have at present.

The PRESIDENT: If you took the Jersey that gave the largest flow of milk at Chicago and the highest show of butter and turned her out to freeze to death, I want to

know how long the flow of milk would continue? You have got not only to have a selection of the cows, but of the men of this country. You want to select the men in order that they may select the cows and breed and handle them properly.

Mr. WHITTON: What percentage of butter-fat was left in the ordinary farmers' milk through the country that the Travelling Dairy has tested?

Prof. DEAN: It averaged all the way from 0 to 2½ per cent., but I think a low per cent. would be ½ per cent.

Mr. HANNAH: At what season would that be?

Prof. DEAN: That would be an average of all the tests taken from 1st May to the middle of December. Some of the samples were set in shallow pans and some in deep setting pails.

Mr. MCCARGAR: Don't you think it would be advisable to ask the Government to make it compulsory to have this Babcock test used? It would do away with a great deal of newspaper talk about dishonesty and adulteration of milk, and we would be able to make better butter and cheese.

Hon. Mr. READ: And the Government would get into a great deal of trouble. I am aware that in the interests of the public—because that is what the Government is always looking after—the Government has been trying to establish the strength of butter-fat at which milk should be sold, and many of you are aware that it has had thousands of samples tested in every part of Canada, from Prince Edward to British Columbia. It aims, if possible, to make 3½ per cent. the standard but finds it cannot do this. We are aware that the cheese at Chicago for competition were taken from every part of this country, and we see that they tested 99½ points and a great many 99 points, and that as a whole the exhibition was most creditable. Perhaps there has not been anything which has occurred that has given this country such a rush up as the exhibition of cheese at Chicago, and it has been made from milk that has not tested 3½ per cent. of butter-fat. Now, the question is, shall we improve our quality if we get a Jersey that goes up to 4½ per cent.? Many think we will not get the quality in that case. Shall we remain satisfied with what we have? By the time another World's Fair comes round we hope to see our butter industry take as high a stand as the cheese industry. I am a dairyman. I have taken a great deal of interest in dairying from its inception to the present time. It is perhaps not right to talk of myself, but I am the father of the whole cheese industry of this country. Hon. Lewis Wallbridge told me years ago I had cheese on the brain, although I might be all right in some things. I said I would give $100 to the first cheese factory built in this Province, and I did. I am just as enthusiastic about the butter industry. To make the most of it we must give our cows proper quarters and feed them properly, which can be done at very little expense. If you are afraid of the expense connected with making ensilage let half a dozen of you club together and buy a cutting machine and go around from one farm to another. Any one can build a silo for $10 or $15 and $100 would buy a feed cutter and horse power. Build a silo and keep your cows in good order.

The Convention adjourned.

THE ASSOCIATION BANQUETTED.

Instead of an evening session, there was a grand banquet at the Huffman House, the Association becoming the guests of the citizens of Belleville for the occasion. Some two hundred persons sat down to tables which fairly groaned under a profusion of edibles calculated to tempt the tastes of the most epicurean. Mayor Wallbridge presided, and after a full discussion by the company of the good things provided in a material shape, announced in order a programme of toast and song which proved both profitable and enjoyable. After the usual toast to the Queen—duly honored by the singing of the National Anthem—the toast "Our Neighbors" was responded to by Mr. John Boyd;

that of "The Ontario Creameries' Association," by President Derbyshire; "The Canadian Dairymen," by Prof. Robertson; "Our Agricultural Institutions," by Prof. Shutt; "Our Provincial Dairy Commission," by Prof. Dean; "Our Great Ally, the Press," by Mr. Andrew Pattullo and members of the local press; the toasts of "The Ladies" and "The Host" being also duly responded to, and the programme concluding, as it had begun, in loyal fashion by the singing of the National Anthem.

SECOND DAY

The Convention resumed at 10 o'clock, a m.

CHEMISTRY AND DAIRYING.

Mr. Frank T. Shutt, chief chemist, Dominion Experimental Farms, delivered the following address: Did I intend this morning to place before you in detail the intimate relationship that exists between Chemistry and Agriculture, to tell you of all the benefits that this science confers upon the dairying industry, I should, indeed, have set myself an herculean—an impossible task, and one which would no less tax my skill than your patience. I shall, therefore, content myself in mentioning a few instances which may serve to illustrate and emphasize in a practical way the benefits to be derived from applying the truths of chemistry to farming in general and dairying in particular. While speaking somewhat scientifically, I shall always keep in view the practical aspect of the question, and for this reason, therefore, I bespeak your earnest attention.

At the outset I would impress upon you that agricultural chemistry is no fad, no expensive amusement to be indulged in by Governments and wealthy men. It explains, it gives the reason *why* of our farming operations. It tells us what is plant food and what is necessary for the sustenance of animals. It distinguishes between the value of soils, of fertilizers, of cattle foods, of dairy products. It enables us to conduct our work on the farm in a rational and economic manner. It is therefore deserving not only of our respect, but of our careful study.

First, let me very briefly define the terms chemistry and dairying; we shall then be the better able to realize the relation between them.

Chemistry is the science that has for its study the composition of all kinds of matter—gaseous, fluid and solid—and the laws which govern and regulate the transformation and recombinations of all kinds of matter.

Dairying has for its principal object the production of milk, and, secondarily, the manufacture of butter and cheese.

The farmer or dairyman creates nothing; he, as it were, superintends or directs certain changes and recombinations of matter; and to do this economically requires skill and knowledge. The formation of flesh, the production of milk by the animal is brought about by changes, chiefly chemical, at the expense of the food consumed. There is therefore a direct relation between dairy products and crop products on the farm, a relation which chemistry explains and allows us to govern. In turn, we find that plants are dependant upon the soil, the atmosphere and rain for their support. They, by their vital processes, convert inert and mineral matter into the substances of their own tissues. This further step in the argument shows us the complete cycle of change—mineral matter into vegetable matter, vegetable matter into animal matter—a change which is always going on in nature, but which needs skilful direction when by it we wish to make our living.

The law of cause and effect holds good in agriculture (and dairying is but a branch of agriculture) as in everything else. It is true that there are several factors in farming over which we have but little control, yet, in a much larger way than most of us imagine we may control and direct our work that lucrative results may follow. Let me give you an example or two of this law of cause and effect as seen in agriculture. If

we continually crop our fields without returning to them plant food, we find that, though slowly yet very surely, they become exhausted of available sustenance or vegetation, and that smaller and smaller yields are obtained. Again, if the cow is kept on a mere maintenance diet she will manage to exist, but she does not, because she cannot, pay her owner. If, however, she is fed a liberal diet of nutritious food, she furnishes rich milk in quantities that not only repays for her food, but leaves a handsome margin of profit. The farmer and the dairyman are manufacturers, and the plants and animals are their agents. The profit lies in producing the largest amount of the best kind of manufactured article at the least cost. We therefore seek to transform, first, the crude material of the soil and atmosphere into vegetable matter, and, secondarily, this vegetable matter into the more costly, the more highly manufactured forms of beef and milk.

One of the problems that confronts us at the outset is that of increasing the fertility of our soils. This is dependant upon several factors, chief among which are the amount of available plant food and a right mechanical condition of the soil. For the latter we know that proper drainage and thorough culture are necessary. They bring about not only a suitable tilth for the growing roots of crops, but at the same time serve to convert much insoluble plant food into forms which may be readily taken up and used by growing plants. Drainage, and ploughing and harrowing permit the air and rain water to freely permeate the soil. The rain water in its passage through the atmosphere dissolves much carbonic acid, and the resulting weak solution of carbonic acid dissolves inert matter which may freely be used by plants. It is thus that our crop yields are increased by good culture, which we may consider a very valuable means of enriching soils—in fact, one of our best and cheapest methods of manuring. Chemistry explains this statement and enforces its truth with all the emphasis of exact science. I cannot stay now to further amplify this important subject, but I have, perhaps, said enough to bring home to you that chemistry teaches us a very valuable lesson when we thoroughly understand what drainage and soil culture do and mean for the farmer.

Experience has taught us the necessity of manuring—chemistry has told why this is so, for she not only enumerates the elements taken from the soil by crops, but the amount so taken. Rational and economic manuring can only result from an application of knowledge concerning the constitution of plants, of soils and of fertilizers. Chemistry assists us in distinguishing between the values of various manures, and proves that poor feeding results in poor manure. Again, by the aid of chemistry we obtain figures that show unmistakably the great loss of plant food that ensues from the exposure and leaching out by rain of manure piles. We learn that the parts so washed out and lost (as occurs in so many Canadian barnyards) are really the most valuable, and that in potash and nitrogen more especially is the remainder poor. Economy in preserving from waste the liquid portions of manure is enforced by the teaching of chemistry. We must take all possible means to prevent this loss, and in this connection I would impress you with the importance of using absorbents in the barnyard, stable, pig-pen, and, indeed, wherever there is liquid manure that may be lost. Chemistry sounds no uncertain note on this question.

And here I might say a few words in favor of the more extensive use of muck as an absorbent. Muck is the semi decomposed remains of past generations of plants. It occurs in vast deposits in almost numberless localities all over the Dominion. At our laboratories at Ottawa we have made many analyses during the past few years of samples taken from British Columbia to Prince Edward Island, and find as a result that this material possesses in itself much plant food, and especially of that valuable, important and indispensable element, nitrogen. When this substance is air-dried it contains on an average 30 lb. to 35 lb. of nitrogen to the ton. At a very low estimate this would make it worth in the neighborhood of $2.50 per ton. Besides the nitrogen, it contains a certain amount of plant food—of potash and phosphoric acid, and, what is perhaps still more valuable, of humus. This latter exerts a kindly influence on the tilth, increasing its absorbent and retentive qualities, and by its decay produces carbonic acid in the soil, which, as we have already seen, sets free locked-up plant food. As an absorbent it stands very high, being capable of holding large quantities of liquid manure. The fermentation which this manure-holding muck subsequently undergoes converts the

nitrogen of the muck into food at once available for crops. I would, therefore, earnestly recommend you to make use of such deposits as may be in your neighborhood, not only to preserve your liquid manure from going to waste, but also as a means of obtaining a valuable composting material at a very low price.

But I must pass on to say a few words as to the relation of chemistry and cattle-feeding. The relative feeding value of fodders is determined very largely by analysis. From chemistry we learn what to feed and how much to feed. I dwelt upon this subject more particularly in my address last week before the Eastern Dairymen's Association at Peterborough. We saw on that occasion that the animal requires a certain amount of food for its sustenance, and that unless that quantity were exceeded, we could expect neither beef nor milk. We further saw that chemistry taught us that in this daily food a certain amount of albuminoids—the nitrogenous constituents of foods—are necessary, both for sustenance and the production of flesh and milk. We discussed the various classes of fodders from the standpoint of their composition—the chemical standpoint. We noted that the grains were richer in albuminoids than the coarse fodders, and the necessity of a mixed diet was impressed upon us. If health was to be preserved and lucrative results expected, a certain quantity of one or other of the meals or grains must be fed with the hay and roots or ensilage. This was demonstrated from the teachings of chemistry and physiology.

In discussing the question of fodder corn and the silo, we stated that it had been proven from chemical analysis that this crop afforded, when properly grown, the largest amount of real cattle food per acre of all the coarse fodder crops. Figures, the result of chemical investigation, were brought forward which showed the folly of sowing the valuable crop broadcast instead of in hills or rows—that seeding too thickly and cutting too early resulted in a very large loss of cattle food.

In preserving corn in the silo, it is chemistry that points out that the one great principle to be acted upon is *exclusion of air*, if sweet ensilage is to result. It is the oxygen of the air in the presence of moisture that induces and favors fermentation, and fermentation means development of acid and deterioration.

While speaking upon this subject, I wish briefly to draw your attention to the valuable aid chemistry has recently given to agriculture in explaining why clover, peas and other members of that family of plants known to botanists as the leguminosæ, are such profitable ones to grow and how the soil is enriched rather than impoverished by their growth. The analysis of these plants shows that they are particularly rich in the flesh-forming, milk-producing constituents—the albuminoids, which, as we have before remarked, are characterized by containing nitrogen, by being indispensable to the animal and being the most costly of all the food constituents. In feeding value, clover and clover hay is vastly superior to timothy—a fact I fear most of us do not thoroughly appreciate or realize. Secondly, chemistry has shown that the nitrogen which goes to the formation of the albuminoids in these plants is taken largely from the atmosphere, a property not possessed, as far as we know, by any other class of plants. They have therefore been termed nitrogen collectors in contradistinction to other farm crops, which may be called nitrogen consumers. The decay of the roots of these plants leaves the soil richer in nitrogen than it was previous to their growth, and this nitrogen is available as food for succeeding crops. The lesson to be learned from this is, grow more clover and at once increase the value of your cattle food and the fertility of your soil.

Lastly, chemistry enables us to ascertain and distinguish between the values of dairy products. The analysis of milk gives the dairyman just the information he needs to carry on his work intelligently. Thereby he knows which cows are paying him, which to keep and breed from and which to discard. But of this I purpose to speak further to-morrow in my address upon the right method of paying for milk. Chemistry exposes such frauds as "black pepsin" and the like, which are now being perpetrated upon our farmers. We know from analysis that we obtain practically all the butter-fat by the best methods of dairy practice now in vogue. Anything further obtained by addition of chemicals and "processes" must be curd and the result not butter, but a butter-like material containing a large percentage of curd.

To dairymen there are few things so important as a pure, a wholesome water supply. Too many of our cattle are drinking polluted water, derived largely from the drainage of barnyards. Good health, vigorous growth, wholesome milk are as dependent upon pure water as upon a liberal supply of nutritious food. Wells should not be located where there is any danger of contamination. Clean the wells occasionally and keep the surroundings free from rubbish. And finally, if you have any doubt as to the purity of your supply write to the Experimental Farm at Ottawa for instructions how to take and ship a sample for analysis. The chemical analysis will clearly show if the water is fit for drinking purposes. The analysis is made for farmers free of charge.

I have only been able to give you a very few illustrations to exemplify this intimate connection of chemistry to dairying ; time forbids more. I trust, however, that I have awakened a deeper interest in—a greater respect for agricultural chemistry and a more intense desire to study for yourselves this subject of agriculture by the light of chemistry. Be assured of this, you will be much benefited by such a study, and further, that the prosperous dairymen of the future will be those who master and apply the truths that I have here so feebly set forth. (Applause).

THE BUTTER WANTED AND THE PROPER METHOD OF SECURING THE SAME.

Mr. A. A. Ayer, of Montreal, was introduced and said : I suppose most of you know how to get a young married woman to think you are one of the finest of fellows and the best judge of human nature that she ever met. If you don't know how I will tell you. Just tell that young lady that you have seldom seen so beautiful, so lovely, so intelligent-looking a baby as her's is, and you will have reached her heart and through that her husband's. Now, you must be aware that the way to get the dairymaid's heart is to tell her husband that his wife makes the finest butter in the world.

My purpose this morning will be largely to throw out hints, and if I do not praise the butter of Canada you will know the reason why.

Now, first, you must be more careful of what you feed cows than you are of what you feed yourselves. One illustration—a man may eat leeks and onions, but I would advise you not to feed your cows leeks if you want to improve your butter. My friend who has just spoken has alluded to the water which cows drink. I want to give you a single illustration showing the importance of that matter—There was a certain cheese factory among the hills, in our province, where spring water was abundant. There were large dairies in the neighborhood. There was no reason in the world why the cheese of that factory should not be perfect in flavor, and yet we found to our surprise that that factory was developing a very bad flavor. We could not detect it in the cheese until they were thirty days old. They were apparently all right when bought, and we could not believe that there was anything wrong with them until we saw them afterwards in England. Last summer one of the dairymen living on a rock on the top of a hill, died. This man had a well, I suppose 300 to 400 feet from the barn, he had blasted in the rock, and struck water 25 feet from the surface. This was the water they were using for man and beast—apparently as fine water as could be found anywhere. The man was taken ill with typhoid fever. The doctors could not account for the cause. Finally he died. Next the wife was taken ill. Then, doctors became alarmed. The well was so situated that it was thought it must be all right. However, they resolved to analyze the water. What did they find? They found in that water there were traces of the stable, which by some means filtered down through the rock into the water, which killed the man and nearly killed the wife. This may be an extreme case, but it shows how careful you require to be, and I think the day is not far distant when the farmer will have the water analyzed that his cattle drink as well as that which he drinks himself.

I have strong objections when I go into a farmyard or into a farmer's stable and see a man milking in an uncleanly way. I do see it very often, and I nearly lose my temper. It is utterly impossible to have the finest butter if a farmer does not keep his stable clean and keep himself clean. You cannot strain the flavor out of milk which is dropping into the pail. I suppose that when the best books are all written up we shall find somewhere in the 1st chapter and the 1st verse of the Gospel to farmers this passage: "Cleanliness is next to godliness," and I hope that it will be written in such large type that it may be easily read, and that it will be hung, not only in the dairyman's house, but it the stable as well.

Now, we come to the keeping of the milk. Last summer I passed a farm house one evening after the milking. In this case the farmer takes his milk to the factory in the morning, keeping it over night. He wanted a place that was cool and safe from rain, and the most convenient place he could find was a lean-to next to the hog pen. That might be very convenient for the keeping of the milk, but was very inconvenient for keeping the flavor of the milk. Now, that may be an extreme case, but many a man leaves his milk exposed in such a way that it is simply ruined beyond the possibility of getting out of it the finest butter. You cannot find anything that takes a flavor quicker than milk, and you must be careful to the greatest possible degree of the place where you keep it. The place must be absolutely free of flavors that will hurt your milk. Otherwise you cannot have the best butter. Why I approve of the separator is that you can take the milk away from the farm at once and have it separated before it has been exposed in places where it can get all these horrible flavors. I believe the sooner it is put into the separator after milking the better, because it is easier to protect a small quantity of cream than a large quantity of milk.

If you have not a clean creamery you have another difficulty. How many of the creameries are absolutely clean? How many of them have the sour milk right next door to where the churning takes place, or right next door to the creamery itself, or so near to it that whenever the wind blows that way it will carry over the sour flavor to the cream?

Now, as to the next process—butter working—I suppose it is possible to work butter by machinery, as it is possible to make butter by machinery, but I must confess that I have not seen it worked successfully in that way to any great extent in Canada, and I have seen a great many failures In fact, nearly all the creameries that work the butter by machinery spoil more or less of it. What I mean is this, that if you can depend on the butter as it comes from the churn being in an absolutely proper condition, and at the same temperature all the time, then you may be able to start the machinery and run for the same number of minutes and have the same results; but you cannot always have the same conditions, and the chances are the butter-maker is apt to be a little careless, and just as soon as he is careless he spoils the butter if he works it by machinery. I believe in getting in a little hand work just at this point. That is the point where the maker needs to use the greatest possible care. If he looks after the separator and churn and sees that everything is absolutely clean, it is all right to work by machinery up to this point, but he must be careful not to spoil the butter at this point. He had better use his hands, when he can watch, with the feeling of the hand and eye, all the time, the exact state it is in, so that he can get it to the proper grain and proper consistency for packing. Of course it is claimed that with the butter-making machines all the butter-milk will be expelled. I grant that, but there is just the danger of its being spoiled by over-working.

Now, I come to the point which I regard as being one of the most important, and one of the weakest in the manufacture of Canadian butter to-day, and that is the salting. Well-salt may be good for butter, but it is very difficult to find it and the bulk of it is not. The bulk of well-salt will give a peculiar flavor to butter which the expert will at once detect. There are only two sections in the United States where they can get well-salt that is fit to use. What is the matter with the salt? People tell us that Higgins & Ashton's salt is good. We found some of it the finest, but we found some of it was thoroughly bad. What was the matter? I will tell you. Next to milk, salt takes

flavors quickest of anything I know of. If the salt is exposed in the ship to oil or a dozen other substances, or if it is packed in the ship where other substances have been packed it will be spoiled. Fish or tar are some of the worst substances with which it may come in contact. Don't have any tar paper about your creameries. Just put some tar ten feet away from your milk and let it stand and see if you cannot taste tar in the milk. Salt is liable to get these flavors on the wharf or on the railway car or at the railway station. We had an illustration of this in Chicago, in the case of a creamery that used to have the very finest of butter, which generally stood at the top of the market. This butter came to market in bad flavor. An expert was sent to the creamery, but found nothing wrong about it. It was a perfect creamery. Finally the expert said, "Where do you keep your salt?" "We keep it in the shed there," said the butter-maker, "with nothing but the free air of heaven floating over it." "Let me see your salt" said the expert. There it was in an open shed. The expert looked all about the place, but found nothing wrong. Afterwards he went around to the other side of the shed and found a horse mark. "There is your flavor," he said. "You keep your horse there and the salt on the other side of the partition. The salt is not fit for anything. It has spoiled your butter.

Now, we come next to flavor. Well, that is a pretty hard question to discuss. For the past two years I have been talking in Montreal about woody flavor, and I have been almost laughed at in regard to that. But there has been a flavor I called a "woody" flavor. Two years ago I pointed it out. Well, I confess to you I learned a good deal in Chicago this year. That is one of the things I found out. Two of the judges there with me were two of the finest judges I ever saw. We compared a good many notes there. One of the first things I struck in Chicago was "woody" flavor. When the doors were closed the first day we thought we would locate the cause of it. The cause in that particular case was found to be an ice house, but we carried it to the extreme before we got through and found it comes from a good many things. It comes from bad wooden packages; it comes from ice houses, and now and again from cold storage refrigerators. The worse the wood, the worse the flavor. If the wood has become rotten, if the floors have become water-soaked, the butter will take the flavor of the wood. We had discovered this and knew it had become a very serious question, especially with parties who had ice-houses where the floors had been water-soaked for years. Now, this is a very difficult thing to avoid, but you should not use sawdust. Of course, there is some danger of getting this flavor even if the wood is very dry. One of the very worst causes is butter standing a long time before it is packed, because it not only gets "woody," but it gets "windy." It gets a flavor from being exposed to the air. To avoid the butter getting a woody flavor, use parchment in the boxes.

Packages. You know the New Zealand and Australian package for a few years has been a square box. That is all very well, providing you are going to ship your butter pretty soon, but they are beginning to find that this "woody" flavor is being developed in these packages. For Canadian butter let us have a Canadian package made in the best possible way. If the butter is for export, the larger it is the better. I say this because there is less surface to be exposed, and, on the whole, I believe the best way to pack is in a keg of 112 lb. to the package. We have been trying it now for four or five years, and my conclusion is that this keg gives the best results and is the best package to use. It is safer from heating and accident than any other package.

One point I want to speak of is that the modern place of keeping butter is not built of wood. It is expensive. It is built of stone or brick, with air-spaced walls, and with the very best compressed brick all over the inside,—with hard-wood varnished and painted floors,—with everything about it absolutely pure, and from which the butter can get no flavor.

I want to say a few words about Chicago which may be of interest to you. What was wrong with the Canadian butter?—Flavors—fishy flavors, woody flavors, windy flavors, all the flavors. For body, for texture, we were right up on top. When we have the body and the texture there is no reason why we should not have the flavors. If you do not milk clean, if you do not protect your milk and cream, and butter and pack-

ages, you won't "get there," but if you do you will. We are behind in packages. You should have seen the way the tops of our packages looked at Chicago. Some of them of course looked nice. The top of a package ought to be as smooth as polished marble. Do not stamp the top. Fill the package to the top. What do you want to leave a dead-air space for? When you send butter away to get a prize send a nice top. Have some style about it and then you will succeed.

I suppose some of you may have thought there is no encouragement for butter in Canada. Do you know that but for the duty I could bring New Zealand and Australian butter in here and get 2c. per pound profit on it. The fact is we are obtaining the best average price in the world. The price is right, and the fact is you are not going to improve the price until you improve the quality, and when you have done that the solving of the rest of it is as easy as falling off a log.

Mr. A. PATTULLO, of Woodstock delivered an admirable address on good roads in relation to the dairy which will be fully given in the Report of the Good Roads Convention held in Toronto in February of this year.

THE RELATION OF THE PATRON TO THE CREAMERY.

Mr. J. W. WHEATON, of London, Secretary of the Dairymen's Association of Western Ontario, being called upon to address the Convention, said:

I am glad to to-day to have the privilege of meeting the creamerymen at their Annual Convention. This is the first time I have had this opportunity and consequently I appreciate it very much. The Creameries' Association and the Western Dairymen's Association, which I represent are both working to promote the dairy industry of this Province. In one way, however, the Dairymen's Association of Western Ontario, is doing a more important work than the Creameries' Association. There are two principal constituents in milk, viz. casein and butter-fat. The Creameries' Association looks after only one of these—the butter-fat, while it is the duty of the Western Association to look after both the butter-fat and the casein and in this respect we are doing a more important work than you are here (Laughter). I am to speak to you this afternoon on "The Relation of the Patron to the Creamery," and I crave the indulgence of the creamery-men present if in my address I make special reference sometimes to the cheese factory as my work has been more closely connected with that branch of the dairy business.

The success of our dairy industry depends upon co-operation. It is due to the united effort of dairymen in the past, and to the fact that they organized co-operative factories and formed larger organizations to look after their interests, that we are to-day turning out such a large quantity and such a good quality of dairy products. Private dairying as a rule has not been very successful in this country—due perhaps to the distance they are from the market, and to the fact that the individual has not the same facilities for making up his product, as the co-operative or larger concern has. There are these factors that go to make up this co-operation, viz: The manufacturer or company, the cheese-maker and the patron. Each of these has specific duties to perform in order to maintain this co-operation successfully, and upon the united efforts of these three factors depends the success of the enterprise.

The manufacturer and company can only maintain that proper relation to the concern by giving particular attention to their duties. It is the manufacturer's duty to provide the best buildings to be had for the purpose. There are too many factory buildings unsuitable for carrying on the business successfully. Many of them are built as if the owner only intended to continue in the business a year or two. All buildings should be kept in good repair and have the best equipment possible. Unless the floor and drainage are perfect and the machinery for manufacturing of the best kind, cleanliness cannot be maintained—and upon cleanliness in the factory as well as on the farm depends in a very large measure the quality of the goods turned out. It is the duty of the company also to keep the patron posted as to the business being done. Pass books.

or statements, showing the amount of milk supplied by each one, should be sent around regularly. This is too often neglected, especially in our cheese factories, and is the cause of considerable dissatisfaction. It will pay every management of a cheese or butter factory to go to considerable expense in this regard and keep their patrons thoroughly posted. The manufacturer should see that every patron who supplies him with milk has his just rights. This can only be done in connection with our cheese factories at least by paying everyone according to the percentage of butter-fat in the milk.

The cheese or butter-maker's relation to the business is very important. I will not dwell here on his specific duties. Upon him depends largely how the patron will be pleased with the co operation. A cheese or butter-maker can either make or break the concern. It may be well just here to draw attention to the fact that many of the makers are not too well paid, considering the responsibility they assume, and the amount of work they do. It is very poor economy to cut down the wages of a good man, as it tends to discourage him and causes him to lose interest, and this will very materially effect and lessen his usefulness. A good maker should be encouraged in every way and if need be increase his salary instead of lopping it off at every opportunity.

I now come to the patron and it is upon his relation to the business that I want to speak more particularly to day. Upon the energy, skill and good judgment he puts into the selection of his cows, their care, feed and the handling of the milk,will depend largely the success of the business. The patron is just as important a factor in maintaining the success of a cheese or butter factory as the maker or manufacturer. Therefore his position should be well understood and more than a mere passing notice given to him.

What should be the proper relation or the attitude of the patron towards the creamery or cheese factory? He should not feel that he is conferring a great favor upon the proprietor or company by supplying milk. This feeling is only too prevalent in many districts, and especially in those where the dairy business is new. In my own work I have frequently met patrons whose only object in supplying milk was not to get any great benefit from it themselves but merely to help the thing along, and do the proprietor or maker a good turn. This may be the right kind of spirit to have towards the concern but unless a patron makes a business of it, and supplies milk because he realizes that there is a good profit in it, he is not going to reap any great reward for his labour or confer any great favor upon the factory and contribute much to its success. The patron should look upon the creamery or cheese factory as of particular benefit to himself. In the first place, it affords him an opportunity of carrying on the most profitable branch of this business of farming. Opportunities are somewhat like girls, much more to you after they have been embraced. Every creamery or cheese factory erected in any locality furnishes every farmer in that locality with the opportunity of realizing the highest possible profit out of his cows, and should be taken advantage of by him. Then every creamery or cheese factory enhances the value of a patron's farm. Farms within a radius of five miles around any factory will sell for from ten to twenty per cent. more money than if there is no factory. This is easily shown to be true from the fact that in our chief dairy districts not only are the farmers in better circumstances financially and are not feeling the hard times to as great an extent as in non dairy districts, but also the farms will sell for a considerably higher price. It is not well for the patron to maintain an attitude of suspicion towards the factory. If there is reason for it let the managers know at once so that the wrong may be made right. It will do neither the patron nor the factory any good to be suspicious without first finding out the cause. The patron should also see to it that he receives an accurate statement of the amount of milk he supplies and the price paid, either every week or at least once a month. The pass-book sent out every week or a monthly slip with each day's supply of milk entered, serves the purpose very well. A patron who insists upon having his accounts regularly should not be looked upon as not having faith in the integrity of the maker or manager. It is merely a matter of business and the more our creameries and cheese-factories are run on strictly business principles, the more successful they will be and the less dissatisfaction on the part of those patronizing them. These may be considered as some of the minor points in connection with this co-operative system, but it cannot be maintained successfully unless they are looked after.

Let us now look at some of the duties of the patron, which are incumbent upon him to peform if he is to maintain his proper relation to the creamery or cheese factory. These duties are important. In the first place because the patron controls the machine which manufactures the milk, viz., the cow, and secondly because he has control of the milk at a stage when it is most liable to become contaminated by foul odours and is most susceptible to injury from without. When a patron agrees to supply the milk from a certain number of cows to a creamery or cheese factory it is his duty to get the very best cow to be had for the purpose. Unless he makes an effort to do this, he cannot be said to be fulfilling his part of the agreement. One man may agree to supply the milk from ten cows and then not send as much as his neighbor who only supplies five cows' milk. During my visits among the factories in Nova Scotia, I came across a patron in Cape Briton who supplied the milk from twenty cows to the factory and all he sent per day was 200 lb. and this during the month of July. That man was not conferring any great favor upon the factory in his locality, nor reaping any profit out of the business himself. Not only should the patron provide the best cow to be had, but he should see that his cows are in proper health. Good wholesome pure milk cannot be got from an unhealthy cow.

Then it is important that the patron should have the cheapest and best feed to be had for his cows. Let me here repeat somewhat. If a man agrees to supply the milk from a certain number of cows to a creamery or cheese factory he cannot fulfil his part of the agreement, nor maintain his proper relation towards the concern unless he supplies his cows with good, succulent, nourishing food in order that they may do their best, both for himself and the factory. A man may get the best cows to be had and then neglect to supply the necessary food for them to produce to their utmost capacity, and by this means he will be guilty of a non-performance of his duty. Cows should be supplied with lots of good, pure water and have salt regularly. Neglect on the part of the patron to attend to these two essentials will not only lessen the quantity of milk his cows will give but will injure the quality as well. It is also very important, since the patron has control of the cow, that he should give her the best of care. I believe there is more money lost to the dairymen of this country by careless, rough treatment of their cows than by any other means. It is generally more natural for a man to treat his cows roughly than to handle them gently, and consequently the little things in connection with the care of a cow are too often overlooked. It always pays to treat a cow kindly. The kindness bestowed upon the cow will be reciprocated in the man, who will be more gentle towards his fellows because he is kind to his cows. In this connection I am reminded of what the wife of a prominent dairyman in Oxford county told me last summer. She said, "That whenever she looked after the milking of their twenty-two cows more milk was procured than when her husband looked after the milking." The reason was the wife would not allow anyone to talk in the milking yard during milking; while the husband was not so particular about it, and thus by attention to one of the little things quite a little item of profit was obtained.

I will not go into the details connected with the care of milk but merely draw attention to the importance of the duties the patron has to perform in this regard in order to fulfil his part of the agreement. The milk, from the time it is taken from the cow till it is placed on the stand for the drawer, is under the complete control of the patron. Consequently it is essential for him to see to it that that milk is taken from the cow in as cleanly a manner as possible; that it is strained carefully into the milk can; that it is properly and thoroughly aired before being placed to keep over night; that it is kept over night in a place where the atmosphere is pure, and lastly that it is sent in the condition in which it was taken from the cow. The patron who deliberately adulterates milk supplied to a creamery or cheese factory, by skimming, watering, or tampering with it in any way is not only *not* maintaining his proper relation to the concern but is actually robbing the patrons who are sending good honest milk.

The duties I have mentioned may be considered as the little things in dairying, but they are important nevertheless, and the patron can only maintain his proper relation to the business by giving particular attention to them. Upon the attention given to these little things in the future will depend largely the improvement we are going to make in the quality of our dairy products and the success of the industry in general.

Considering the importance of the patron's relation to the business he should not be neglected, he should be as thoroughly educated in his branch of the business as the cheese or butter-maker should be in his. The patron has been too much neglected in the past. Until comparatively recent years, Dairymen's Associations and other organizations have directed their attention chiefly to educating the manufacturer and maker while the patron has been left to shift for himself to a very great extent. I am glad, however, to notice an improvement in this direction. The association or organization that at the present time and in the future will give particular attention to educating the patron and informing him in the best methods of carrying on his part of the work is the one that will do the most to promote and develop the dairy industry of this Province.

THE DAIRY SCHOOL AT THE ONTARIO AGRICULTURAL COLLEGE, GUELPH.

Prof. DEAN spoke briefly on the dairy school which was established at the College last year. When first started it was an experiment, but experience had warranted them in enlarging their accommodations during the past year, and they were now prepared to give 100 students (double the number they could accommodate in 1892), practical instruction in the factory system of making cheese, running of separators, manufacturing butter and the testing of milk. In addition, there was room for 10 or 15 students in the Home Dairy course, where farm dairying was made a specialty. No pains were being spared to make this the best equipped school of its kind on the continent. The best appliances, the best instructors, and the latest and best information were supplied to those students who can come for only a short time.

After the special course students are through, the practical work is continued for two weeks for the benefit of the regular Cottage students, who thus have the benefit of the experience along with the lectures given on the subject of dairying.

The object of the dairy school is to give practical and scientific instruction to butter and cheese-makers and also to home dairymen. How best to attain this object was fully considered at the beginning, and the first thing to decide was the best place. For the following reasons the Agricultural College was considered the best place, though it was not situated in a dairy district:

1. A competent staff of lecturers were already employed there and they could give the additional lectures at very much less expense than if a separate staff were employed. The only additional expense in this connection is the instructors of the different departments.

2. The College farm and stock afforded students ample opportunity to gain information that cannot be got elsewhere in the Province. Here they may see representatives of all the leading breeds of cattle, sheep and swine and the manner of handling these in regard to stabling and feeding. Every butter and cheese-maker should be able to advise patrons in the selection of dairy stock and also give hints on methods of feeding, etc.

3. There were already at the College some dairy buildings and intensils and these were utilized as far as possible for dairy school work. A new building had been erected during the past year which was a model of its kind and gave every comfort and convenience.

Last year a considerable difficulty was experienced in getting a supply of milk for students to work with, but this year they had very little trouble in securing a full supply in the vicinity of Guelph. The expense was greater than it would be under ordinary circumstances as the supply was only needed for such a short time. If we could but clear ourselves and have nothing for manufacturing we should be satisfied, so far this has not been realized.

In 1893, five instructors were employed, and in 1894, there are seven. These men rendered valuable services to the school. The staff this year consists of:

A. T. BELL, Tavistock, Chief Instructor in Cheese.

T. B. MILLAR, London, Assistant Instructor in Cheese.

M. Sprague, Ameliasburg, Instructor in Butter.

H. L. Beckett, Hamilton, Assistant Instructor in Butter.

J. McTavish, Seaforth, Assistant Instructor in Butter.

L. A. Zufelt, Chesterville, Instructor in Milk Testing.

T. C. Rogers, Our own Dairyman, Instructor, Home Dairy.

To find homes for so many was thought to be a difficult task at first, but plenty of good board can be obtained in and near the city for $2.75 to $3.00 per week, thus making the course a comparatively inexpensive one.

Methods of Conducting the School.

Lectures are given by the whole of the College staff, thus bringing the dairy students into contact with all the professors, and also giving them a breadth of knowledge much wider than devoting all the time to one subject. What might be called the outside subjects were made to take as practical a bearing on the dairy as posssible. Altogether there are given 50 lectures, comprising 28 on dairying, 4 on agriculture, 4 on veterinary science, 4 on botany and geology, 4 on Chemistry and 6 on mathematics, and book keeping.

Lectures commence each morning at 8:30 and last one hour when the students are distributed to the four departments—cheese, separators, churning and milk testing, and and the home dairy students go to their work. They are rotated from one department to the other, each student spending a day in each department every fourth day. In case a student desires special work in any particular branch he or she is allowed to devote more time than usual in that department so long as no one department is overcrowded.

In the work, blank forms are given which students are expected to fill out each day. This teaches them to be systematic and careful. The following are samples of the forms filled out each day in the four departments:

Cheese Work.

Report by ..... Date..... 189..

Vat used .....
Condition of milk .....
Per cent. of fat in milk .....
Pounds of milk in vat .....
Rennet test for ripeness .....
Temperature set .....
Time set.....
Amount of rennet used .....
Rate of rennet per 1,000 lb. milk .....
Time cut .....
Minutes in curdling.....
Time steam was turned on.....
Time required in raising to.....degrees .....
Hot iron test when dipped.....
Time dipped .....
Time from cutting to dipping.....
Per cent. fat in whey.....
Time ground.....
Hot iron test when ground.....
Time salted .....
Amount of salt on curd.....
Rate of salt per 1,000 lb. milk .....
Time put in press .....
Kind and number of cheese made .....
Time dressed .....
Time pressed.....
Weight of green cheese.....
Average weight of milk per pound of cheese .....
Highest and lowest temperature of curing room for last 24 hours.....

Remarks:

Report by..... Date.....189..

SEPARATOR WORK.

Machine used.	Weight of Milk.	Temperature of			Revolutions per minute.	Time required.	Pounds per hour.	Pounds of Cream.	Per cent. of fat in	
		Milk.	Skim Milk.	Cream.					Milk.	Skim Milk.

Remarks:

Report by ..... Date .....189..

BUTTER MAKING.

Kind of Cream churned.	Weight of Cream.	Age of Cream.	Acidity of Cream.	Temperature of Churning.		Time churned.	Size of Churn.	Salt.
				Beginning.	End.			

BUTTER MAKING.—*Continued.*

Per cent. of Fat in		Calculated yield.	Actual yield.		Loss of Fat in Lb.		Inches of Cream.	Test per Inch.	Pounds of Butter by Test.
Cream.	Buttermilk.		Unsalted.	Salted.	Skim Milk.	Buttermilk.			

Remarks:

Report by ..... Date.....189..

MILK TESTING.

Number of Sample.	Lactometer Reading.	Temperature.	Specific Gravity at 60.	Per cent. of Fat.	Per cent. Water.	Per cent. total solids.	Per cent. solids not Fat.

Remarks:

In 1893 there was a lack of room in the butter and milk testing departments, consequently students were unable to obtain as much instruction in these as was necessary for thorough work. This year we have remedied this and can now give thorough drill in these branches. In separators we have nine different machines and five different makes. A number of styles of Babcock testers give students an opportunity to choose the one they think will suit them best.

Every afternoon for one hour a discussion led by one of the instructors or by one of the students on some branch of dairy work has proven a vauable feature of the course. Here practical points which students meet with in every day practice are fully discussed and the asking of questions encouraged as far as possible.

Several times during the course experts on cheese and butter are brought to the school and students receive the benefit of their judgment and criticism on the quality of butter and cheese being examined. These are judged by points, score cards being provided for the purpose. Each student is given a sample of the butter or cheese to score, then his scoring is compared with that of the expert. Some become very proficient in this respect in a few lessons. We think it important that students should know good butter and cheese as well as know how to make it. The following are copies of the score cards used in judging cheese and butter:

JUDGING CHEESE.

Report by ..... Date 189

No. of Sample.							
Scale of Points.							
Flavor	35						
Quality or Body	25						
Color	15						
Texture	15						
Finish	10						
Total	100						

JUDGING BUTTER.

Report by ..... Date 189

No. of Sample.							
Scale of Points.							
Flavor	45						
Grain	25						
Color	15						
Salt	10						
Package	5						
Total	100						

Cleanliness and neatness are emphasized and insisted upon. All the gentlemen are expected to provide nice, clean, white suits, aprons and caps, and the ladies, suitable dresses, aprons and caps. A pleasing sight it is to see the students so equipped and impresses visitors favorably. It also does the students good.

In 1893 five ladies attended, three of whom passed all examinations successfully. It was gratifying to have these young women make a start in this direction and it is hoped more may follow their example. There is need of more examples of this kind. These ladies exercised a good and wholesome influence over the young men, and the good order maintained throughout the whole course was largely due, no doubt, to their presence.

Results.

All students who pass their examinations satisfactorily are granted certificates shewing their standing in the different departments. Last year an attempt was made to visit all students at their factories or dairies before granting these certificates, but I may say that this is almost impracticable. For 1894 certificates will be granted all those who pass the examinations at the dairy school, and special certificates will be given those who send in monthly reports from their factories to the dairy department of the College and give satisfaction as to cleanliness and quality of goods made in their factory to some person appointed by the College. This will tend to keep the dairy students and College in touch, and thus we shall not lose interest in them nor they in us. It will tend to make more uniform goods in the factories and dairies. Instead of there being so many different systems worked on in the factories and dairies all will tend to use one system or method in making. If this system be a good one it will be a decided advantage in producing uniformity in dairy products.

It will also give the makers who attend this school more confidence in themselves and make them more useful in their localities. Many a man is not sure whether he is doing exactly right or not and consequently cannot do so well as he could were he sure of his steps. This confidence may be gained by associating with men who are specialists in their own particular lines.

Lastly it will add value to the dairy industry owing to the fact that more intelligence will be used in connection with the manufacture of milk into commercial products. If the patrons will also keep up with the makers the dairy industry will become more valuable, even, than it is at present.

In case the demand for accommodation keeps up, it may be necessary to have two sessions—one from November 1st to December 23rd and one as at present, from about January 15th to March 15th. This demand for instruction will be met in some way that will be agreeable to all who desire this class of information. The applications for 1894 were much larger than we had room for, even with our increased capacity.

THE WINTER DAIRYING MOVEMENT IN ONTARIO.

Prof. Robertson was introduced to deliver an address on this subject and said: The public advocacy of this movement began at a Convention of the Dairymen's Association of Western Ontario at Ingersoll in 1887. The Ontario Creameries' Association had been formed only the previous year, and I am happy to observe in the audience to-day Messrs. John Hannah and Moses Moyer, who with others were the pioneers in the effort to get the Creameries' Association organized. Excellent as is the work which this Association has done in promoting the manufacture of creamery butter during the summer, it can do still more valuable work in pushing the movement for winter butter-making in creameries. The demand for fresh made butter during the winter months is becoming more active in the home markets as well as abroad. During the past few years, through the Dominion experimental dairy stations, we have been co-operating with the Creameries' Association to bring about a more profitable dairy practice; changes have come and we must conform, as other people have to do, to the circumstances of demand for our products. A man may

go to Ireland and try on some festival day to sell orange colored badges at two pence a piece and they will not go. They may be made of the finest material, but just because they have an orange hue they are not wanted. But if the ribbons were of common calico and were green in color they would go off like hot cakes. I have taken that as an illustration to show that if a man wants to sell advantageously he must meet the preference of the people to whom he wants to sell. There is no use saying you must take whatever offers or go without. The people who used to buy our Canadian butter and relish it have been trained to eat, even if by oleomargarnie, a butter that is mild almost to being tasteless, and if butter has a strong flavor they do not want it. Strong butter is not wanted by the denizens of the great cities of Europe. That brings me to say that the bulk of our trade in exporting butter must be from August onwards when the demand is most active and the weather cool enough for safe shipment and delivery. The demand from the whole civilized world to-day is for a finer and better class of foods. People talk of drink as a cause of crime. It may be, but poor food is as much a cause of crime as drink. If you feed a man on poor, badly-cooked food he comes to believe that his wife and the good Lord and all the world are against him because there is nothing that will bring sweetness into his experience. Those who provide foods have much to do with the well-being of the race. Where you find people huddled into scant space and living on insufficient diet, you find their moral courage ooze out easily and they are fit for any villainy—weak when temptation comes. Find a man fed on good food and breathing fresh air and you generally find a man who is good in every way. People who work in factories will not live on strong tasting food. They will not have strong flavored bacon; you cannot sell them strong butter or strong flavored cheese; you cannot sell these very strong foods, because the people have changed their occupations and require foods fitted to their surroundings. The kinds of food in most active demand to-day are the fine dairy products and the products of mixed farming. There are few articles that go from the farm, that have not suffered from the general tumbling down of prices, except the dairy products and those allied to them. Grains have tumbled; you do not know when they are going to stop tumbling. But creamery butter now is worth as much as it was in the palmiest days of farming. These things have not gone down in price, because there has been a demand for them commensurate to all our increased production. As was said by Senator Read last night in epigram, the things that are wanted from the farm are the cow and her products. You have milk, butter, cheese, beef and bacon from the dairy.

That leads me to ask, when should we produce butter, and why should we produce butter rather than cheese? We get a good revenue from our cheese factories during the summer, but we get hardly any revenue during the winter. It is not a good thing for a man to be flush and then afterwards to be hard up. I go back 20 or nearly 30 years and I can recollect being in a seaside town among coal and iron workers. Their children on Mondays, Tuesdays and Wednesdays had all the bread and butter they wanted and to spare, but on Fridays and Saturdays they were around at various houses begging for pieces. The days when they had plenty were those after the workmen were paid and the rest of the time they were nearly starving. We have been doing some of that kind of thing in Canada in connection with our dairy business. We have had a good revenue from it during May, June, July, August and September, down to October, and then there has not been anything coming in from October until the next May. The people have not been fully prosperous because there has not been a revenue coming in the whole year round. Last year we got from abroad for cheese $13,407,470. Since 1886 we have doubled our output of cheese from Canada and we have been increasing our output of butter since 1889. Now, we should extend our manufacture of butter, because the market may not be able to take much more cheese without a lowering of the price. Last year Great Britain took more of it than ever before, but there was a drouth in the Old Country last year. There may come a time, if we make much more cheese, when we will find ourselves in this predicament, with the profits struck off for one year and nothing better to look forward to the next. For that reason we will be safer by having a large extension of our butter trade—by making butter in our cheese factories after the cheese making season closes. We ought also to have butter made in summer time in localities where there are no cheese factories.

I see no reason why a creamery should run only five months of the year and then stay shut up for seven months.

There comes to us this practical question, which I want to discuss for a moment. Is the making of butter in creameries in Canada during the winter practicable. Can it be done satisfactorily? Well, a little experience is worth a good deal of speculation in proving anything. I had a theory that butter-making in cheese factory buildings during the winter was practicable. I put the theory to the proof by having 2 factories started in Western Ontario in 1891-2, and two more last winter. During the present winter there are five Dominion Dairy Stations in operation in Ontario and sixteen other factories are being run by private enterprise. It is practicable and we have found no obstacle which has not been easily overcome. The obstacle of bad roads and cold weather have disappeared as Will-o'-the-Wisps that had no existence in fact. The cost of fitting up a cheese factory for butter-making will be about $1,000—$200 for making the buildings tenable in the winter time and $800 for machinery. Last winter in three factories we made butter to the value of over $12,000 and realized 22¾ cents per lb. We charged 3 and 3½ cents per lb. for the manufacturing of the butter, and after doing that we were able to pay the farmers 90 cents per hundred pounds for the milk, besides giving them all the butter milk and skimmed milk back to feed stock. Winter dairying therefore is profitable as well as practicable.

There are in the Dominion to-day some 1,600 cheese factories. If one factory in ten would start butter-making in winter we would have 160 factories running and giving in each case from the first year's operating $4,000, from sales of butter. That would make a largely increased revenue from these factories. I am putting the estimate low, because the factory started at Elgin by Dargavel and Murphy is reported to have made $4,000 worth of butter already (in January) this season. That shows the possibility of of winter butter-making and we might as well add this additional revenue to the summer dairy business and make money the whole twelve months of the year.

Let me give you a few of the reasons why winter dairying should be extended farther. It will not displace summer dairying; it will not reduce the patronage of the cheese-factories. It has been found by experience that those patrons who send most milk to the factories in the winter also send most in the summer. There is an immediate revenue from butter-making in winter and as a result the cows get better care and feeding and as a consequence give more milk the next summer and make more money for their owners. Then winter dairying will give paying employment at the farms throughout the winter. I have taken occasion to point out, and I will do it again for a moment, that nearly half the disgust which farmers feel for chores arises from having to do them during the winter without getting from them a direct revenue. It is a good thing to have an honest discontent with one's self and one's occupation sometimes. I never knew a man who did not feel that he was a man from the tips of his fingers to the top of his head when he was coming from the harvest field after a hard day's work. I will tell you what is the hardest work. It is to loaf about a field or a barn or a house or sit on the fence and try to be busy doing nothing. The round of life on the farm in winter used to be, to go out and feed the dry cows; then to come in and sit around the stove in the girls' way until they were fired; then to go out and chop a little wood—always aching to do something. I did have a big discontent with a man who lived in that way and did not wonder at his disappointment trying to kill time agreeably while alternating between the stove, the wood pile, the cow stable and trying to make things tidy about the barn floor. The farmer trying to be satisfied with himself under such circumstances reveals to me the exceedingly wide range of the adaptability of humanity. I would like to have that system lifted out of the farm homes of Canada. There are all sorts of reasons why the farmers' sons are not satisfied and want to leave the farms, but the main one I think is because they are disgusted with the idea of pottering around doing nothing but profitless chores for half the year. Therefore let me say to you seriously, give yourselves a paying occupation for twelve months of the year and you will get leisure for those better pleasures which you will really appreciate. The serious fault in the agriculture of Canada is that we have been living well for 12 months of the year and only earning for 5 or 6 months. Winter dairying will give us remunerative occupation all the year round. It will do

more than this. It will give us a return for the capital we have invested in our business. It is appalling to think of the vast amount of interest which the farmers of Canada pay every year for money borrowed. I do not know that I am prepared to say that a man should never be required to pay high interest, but I am getting to about that point. There is a lot of solid philosophy in the old Bible which holds good in this nineteenth century about this interest and usury business.

It does not pay to have the $175,000,000 invested in dairy farming in this province (according to the Minister of Agriculture for Ontario) giving no return for nearly half the year. If you calculate the interest on this amount for four months at even 2 per cent. it will come to over three and a half millions of dollars. I want this capital to earn that amount of interest instead of going to waste by not being in use. I dislike a cow that gets into that leisurely class that is on holidays for six months of the year. It would be a good thing to employ the cheese-makers all the year around. They would earn more and work for less per month. Now, we will get more milk from the same cows. Mr. Price, who had 30 cows, said he got 25 per cent. more milk from the same cows, the following May after starting winter dairying, than he did during the same month in former years, because the cows were fed on succulent food all winter.

There is not a single weak link in this whole chain of argument. Then the value of the skimmed milk is greater at that season than at any other. It will pay to raise small pigs and have them ready to sell the next June, July or August.

I must hasten to point out to the farmers a few matters to help them to make more profit out of this business. The first requirement at the farmers end of the undertaking is that he himself should have a better comprehension of why he keeps a cow and what his cow was made for, so far as the dairying requirement, of to-day is concerned. A man who keeps a cow for the sake of having a nice-looking cow may be a benevolent man in his disposition, but he is not a good farmer. A man who has a cow should recognize that he is keeping a servant, (who is much inferior to himself), thereby to elevate himself materially, socially and in every other way. The animal should render him more than she gets from him. If she does not, it is just down to this, that he is making himself either the willing or unwilling servant of the cow. There are a great many cows which get more than they give back. A cow will always get more from a man than she returns if she has more judgment than the man and is the main or senior partner in the business. There is usually in partnerships a senior and a junior partner. In this kind of a partnership if the cow be the senior partner the man comes out at the small end of the horn. A cow will do fairly well on 15 or 20 lb. of meal a day with some hay and some nice roots, and she will give us back in milk barely as much as we pay for her feed. She will do just as well without the 15 lb. of meal on 50 lb. of corn ensilage and 5 or 6 lb. of meal with some straw. With these she will pay her way honestly. Therefore the need of our business to-day is to have the man's judgment prevail.

That brings me to say that the constitution of a cow is that power which permits the animal to stay in good health to do good work and to fulfil all the functions of life. If you will go back to the very beginning of cow life you will find a tiny ovum or egg with a membrane around it. That skin which surrounds the first tiny ovum is the same that from the gastrula stage, goes into the stomach of the cow and around the body of the cow. You cannot have the outside skin of the cow mellow, smooth and glossy unless you have the inside of the same skin—her digestive organs—in excellent condition for succulent feed. The need of that skin inside is to have succulent food, and the crying need of the cows all over the country is not for more food, but for juicy food. What made it difficult last year for farmers to keep up the flow of milk in July and August? There was lots of food but the grass which was juicy in June was dry in August. In the course of my enquiry into the growing of sun-flowers, horse beans, and corn I got one answer bearing on this.

"On the the 1st of July it was as fine a crop up to that time as I ever had, particularly in the sandy soil. I never had corn get a finer start, but during the month of August and last half of July, we had no rain and it was so hot that the corn wilted and in the sand, dried up; so that in the dry sandy soil we had only one-fourth of a crop, say 5 tons per acre; and on the damp, clay loam soil, we had three fourths of an average crop, or 15 tons per acre. So that on the whole, we had about half a crop. We usually got

20 tons to the acre ; some seasons, more. I have 200 tons of old ensilage left over from last year ; so that I shall have plenty of feed for the coming year. I have been feeding my 40 cows ensilage all summer. During the months of July and August, our pastures about here were completely burnt up, but with my old last year's ensilage, I managed to keep my cows in good condition, with but little falling off in milk ; and that was caused more by the horn flies than from want of feed. It was a fortunate thing that I happened to have an overstock of ensilage last year."

If you will grow corn—which you can grow in any kind of a year as a rule, if it be well cultivated—I know of no way of feeding so well and cheaply during the dry weather of August. As I have said, the crying need of our cows to-day over Ontario is for juicy food—roots or Indian corn, fodder or ensilage. Then, the cow should be kept in warm quarters—not stables necessarily that are very ornamental. After a time we know that the air of a hall, such as this, where a number of people are assembled, becomes filled with exhalations of carbonic acid gas, and from breathing this atmosphere people become drowsy. I have heard of experiments which have been tried upon rabbits, with air that was charged so high with carbonic acid gas that people would have smothered in it. It made an atmosphere in which rabbits became active and hilarious. You see they burrow and may not need to adopt our notions of ventilation. I believe swine are like rabbits in that respect. There does not seem to be any great need, on the part of a pig, to have an atmosphere as sweet as you expect to find in a parlor. In dealing with cow life we want the stables to be moderately warm, light and well ventilated ; but I have never seen a stable that was not well enough ventilated when the zephyrs of January were playing outside. If we have these things, and succulent food for our cows, we will find they will stay in good health and be kept at less cost to their owners.

There are many instances of the advantages of winter dairying. In the case of Mr. James Whitton, his cows gave 6,093 lb. of milk each in six months last year. The cheese factory ran for some seven and a half months and these cows earned in butter from the winter dairy station at the same place, over $190 after the cheese factory was closed. That paid ; and these cows got succulent food the whole year.

I must hurry on, and say a few words about the making of ensilage of the best sort in the best way as a necessary adjunct to the best method of dairying. Not long ago when speaking of the silo a man asked "is that a new breed of cows?" (Laughter). There is nobody like that here ; but a prominent man in Canada was going across our farm not long ago and he asked "Did you have a very good crop of silos last year?" (Renewed laughter.) Now we are getting a "good crop of silos" in the country. We are sowing the seed for these at these Conventions—at farmers' meetings and by our reports and bulletins. A silo is a convenience that every dairy farmer should have. It is not a luxury. I would use the old fashioned reaper until it would make more noise than fifty thousand clattering fish-wives and save money from investment in any kind of new machinery until I could get a silo. I would do without a mower and go back to the old fashioned scythes until I could get a silo. I would save on all kinds of machinery and have a silo as a farm equipment which every farmer should have. He can build one cheaply. Let him take a corner of his mow and clean it up. Then let him go to the woods and get out timbers strong enough, and big enough and straight enough to make a square bin plumb on the four insides. Let him line the inside with one ply of matched lumber nailed on horizontally. That is a thing anyone can do who can handle a saw and drive nails. A silo is a place that is strong enough to hold green fodder, and close enough to shut out air. The further details can be learned from any one who has built a silo or from our reports and bulletins, but meantime make up your minds to build a box or bin like that and it will keep good ensilage.

As I have said, a silo is merely a convenience for keeping green fodder. Its function is to preserve, not to create or to improve ; and because it cannot do either of the latter wonders some men say it is no use. They put into it, corn sown broadcast, which is immature, which is mainly water and greenness, and then marvel that such ensilage did not feed their cows as well as clover hay. A silo does not regenerate things ; it merely preserves what is put in it. If a man will put corn when it has well formed ears into a fairly tight silo the silo will give back as good as he gave it.

But corn is not enough to feed cows well. They need richer food than corn ensilage alone, because its solids are mainly starch, sugar and things that are heat producers. A corn stalk is a convenience for retaining and supplying heat to animals which live on it. If I want to get warm I do one of two things, I go into the sunshine and get some of the sunshine into me and then I get more of it by eating things which have bathed in the sunshine. The old sun keeps on streaming his warmth on the ground during the summer time. By and bye it finds the corn stalk. A watch spring stores the strength of the hand that winds it, drives the watch and turns the hands. It is a contrivance for retaining strength and expending it gradually. The sun rolls himself in the corn stalk in the carbon from the air ; the cow eats the corn stalk where the sun unrolls himself and warms the cow. That is why a cow which eats corn stalks keeps herself warm on a cold day. Now, a cow while staying warm has to keep on doing things ; and while the sun, in unwinding himself out to the cow through the corn stalk, serves to keep her warm, something more is required for the additional work she has to do, and therefore we give her some other kind of food. If I want to get milk I must give her corn enough to keep her warm and something besides to enable her to make rich milk. One constituent portion of milk is albuminoids. There is not much of that in corn. That is why we give horse beans and clover. Therefore if you put these with corn stalks you furnish albuminoids as well as warmth. In addition to this a cow requires to have her whole vital machinery oiled (so to speak) and the feed should contain fat of some kind. How can you get oil that is cheap enough for cow feed. We can grow an acre of sun flowers for about $20, counting rent of land, cost of seed, labor, cultivation, cutting, harvesting and everything else about it ; and we can get from that acre, over 700 lb. of oil in the heads of the sunflowers. We have the oil in the sunflowers costing less than 3c. per lb. and can sell oil in butter for more than 18 cents per lb. If you can catch oil in the sunflower, which never comes from the soil at all, but from the atmosphere at a cost of 3 cents per lb. and then catch it from the cow in the milk pail and sell it for 18 cents per lb. you ought to have a large margin of profit. Therefore grow horse beans and sunflowers and feed these with Indian corn.

The following are some of the replies received to the circular of enquiry sent to farmers who grew the "Robertson mixture for ensilage" last year :

As yet reports have been received from only some 60 farmers, who gave the mixture a trial during the last summer. On account of the unusual weather, the bean crop appears to have been a total or almost total failure in most places in the Province of Ontario. In the Maritime Provinces, where the rainfall and temperature were nearer the normal, the reports are favourable and indicate what might be expected in other parts of Canada, when regard is had to the time of planting which is most suitable for the different localities. I quote the following from reports received from some farmers in the Provinces of New Brunswick and Quebec :

In all these cases the mixture was planted according to the directions in the circular which accompanied the seeds, with the corn and beans mixed in the same rows and the sunflowers grown in rows by themselves.

From Mr. Z. R. Estey, Lower French Village, York Co., N. B.

"Q. Beans : Were the pods formed, filled or ripened ? A. Mostly filled and ripened, and shelling considerably.

Average height of plants ? Four feet.

Yield per acre ? Eleven tons of corn with four tons of beans.

Yield per acre of sunflower heads ? Five or six tons.

General Remarks : The beans I am convinced should be planted later than the *Longfellow* corn."

From Mr. Abram Alward, Butternut Ridge, Westmoreland Co., N. B.

"Q. Beans : Were the pods formed, filled or ripened ? A. Some stalks contained a large number of pods, some ripened at bottom, other stalks contained no pods, blossoms seemed to be blighted.

Average height of plants? Three feet six inches

Yield per acre? Of sunflower heads, about 200 bushels; of corn and beans, about 8 tons, green weight, of which 5 tons of corn and 3 tons of beans.

General Remarks: I am fully convinced that by planting the horse beans *early* with the corn, one can increase the yield per acre from 3 to 4 tons without injury to the corn in any way, and the beans seem to grow better and fill fully as well among the corn, as they do planted separate."

From Mr. E. C. Cole, Moncton, Westmoreland Co., N. B.

"Q. Beans: Were the pods formed, filled or ripened? A. Pods formed very well along whole length of stalk, ripened near butt, and fairly well filled half way up.

Average height of plants? Three feet.

Yield per acre? Of sunflower heads, seven tons; of corn and beans, about 12 tons, of which three-fourths for corn and one-fourth for beans."

From Mr. Joseph R. Taylor, Taylor Village, Westmoreland Co., N. B.

"Q. Beans: Were the pods formed, filled or ripened? A. About one-half of the beans were ripe, the rest well filled.

Average height of plants? Five feet, six inches; some of the stalks measured as high as seven feet.

Yield per acre? Of corn and beans, 16 tons, 130 lb.; of which, estimate about two-thirds for corn and about one-third for beans."

In this case the sunflowers were almost a total failure on account of the storm.

From Mr. Percy G. Mills, Rockville, King's Co., N. B.

"Q. Beans: Were the pods formed, filled or ripened? A. The lower ones were ripened.

Average height of plants? Three feet.

Yield per acre? Of sunflower heads, 4 tons; of corn and beans, 15 tons; of which, estimate 10 tons for corn and 5 tons for beans."

From M. F. G. Goodenough, Robinson, Compton Co., Que.

"Q. Beans: Were the pods formed, filled or ripened? A. Some were ripe.

Average height of plants? About three feet.

Yield per acre? Of sunflower heads, 4 or 5 tons; of corn and beans, about 12 tons; of which, estimate 8 tons for corn and 4 tons for beans.

General Remarks: I think the beans are a fine thing. I will plant them with all my corn next spring if I can get them."

From Mr. Fred. Burns, Island Brook P. O., Compton Co., Que.

"Q. Beans: Were the pods formed, filled or ripened? A. Well filled and some of them ripe.

Average height of plants? Four feet.

Yield per acre? Of sunflower heads, 7 tons; of corn and beans, 22 tons; of which, estimate 16 tons for corn and 6 tons for beans."

From Mr. Cecil A. Barton, Frelighsburgh, Missisquoi Co., Que.

"Q. Beans: Were the pods formed, filled or ripened? A. Ripened.

Average height of plants? Four feet.

Yield per acre? Of sunflower heads, about 6 tons; of corn and beans, about 12 tons, of which, estimate 11 tons for corn and 1 for beans.

General Remarks : I found some beans six feet high and containing 40 pods. The beans were ripe and a good many of the stalks of them dry when harvested. For that reason, they did not weigh as they would have done had they been cut earlier. I had one sunflower head, 13 inches in diameter, which contained one quart of seed when shelled. I prefer one large head of sunflower to many little ones, as the seeds in the small ones are seldom well filled, and they are very much harder to harvest."

Very much valuable information on several aspects of the growing and cultivating of corn, horse beans and sunflowers has been gained from the full reports which were sent in by the different farmers who gave the mixture a trial. From that source and the results of our own experience I offer the following recommendations for the growing of this mixture for the coming year.

The horse beans and sunflowers can be obtained from almost any of the dealers in seeds. It is not considered necessary or desirable that seeds should be furnished by the Experimental Farm, after information is available on the desirable methods of cultivation, and after they can be obtained from the seed merchants.

Soil. If a field with a drained, warm, loamy soil be convenient to the silo, and can be used, it should be selected in preference to a heavy clay or wet clay for Indian corn. The horse beans do well in clay soils. In all cases the land will be the better for receiving a liberal dressing of manure. It should be ploughed in the spring and be harrowed to a state of fine tilth before the seeds are planted.

Time to Plant. The time at which Indian corn for fodder may be planted with the best results, in most districts, is during the last ten days of May, or late enough in the season to escape frosts at night and early enough to give the plants the advantage of as long a season for growing as is practicable. The horse beans and sunflowers are less liable to injury from frost than Indian corn.

Throughout the Province of Ontario and the western portion of the Province of Quebec, the horse beans may be planted with advantage from two to three weeks later than the Indian corn.

The sunflowers should be planted as early in the spring as is practicable,—otherwise the heads may not ripen in time to be put into the silo.

Proportion. The mixture should contain about 10 tons of Indian corn fodder, to about 2½ to 3 tons of horse beans and about 1 to 1½ tons of sunflower heads. To obtain it in these proportions, it should be grown at the rate of one quarter of an acre of sunflowers, and half an acre of horse beans, to every acre of Indian corn.

How to Plant. Throughout the Maritime Provinces and in the eastern part of the Province of Quebec, the Indian corn and horse beans may be mixed together and planted in rows 3 feet apart, with from 2 to 4 grains per lineal foot in every row. Elsewhere a larger crop of bean plants, not too ripe and dry for the silo, may be ensured by planting them separate from the Indian crop.

The Indian corn may be planted in rows 3 feet apart, with from 2 to 3 grains per lineal foot in every row. A horse power corn planter or seed-drill may be be used for that purpose. Or it may be planted in hills 3 feet apart both ways, with from 4 to 6 grains in every hill. A horse-power or hand corn planter may be used. If neither of these implements and no other suitable planter be available, furrows 3 inches deep may be ploughed 3 feet apart. The seeds may be put in them and covered, after which the field should be rolled.

The horse beans may be sown in rows 3 feet apart, with from 3 to 6 grains per lineal foot in every row. The same machinery or method may be used as for the sowing or planting of the Indian corn.

The sunflower seeds are to be planted by themselves, in rows 3 feet apart. Not more than one plant per lineal foot in the rows should be left to grow. If they come up thicker, they should be thinned out to one plant for every 12 or 18 inches in the rows.

We are feeding, on the Central Experimental Farm at Ottawa, cows and steers, giving them 4 lb. of grain less per head per day with this Robertson mixture for ensilage than with the ordinary corn ensilage. Now, if we can do this with equal yield of milk and gain in weight there will be a great economy. Where we grew the beans by themselves we had an average of 8 tons, 927 lb. per acre. The cost of the rent, labor, seed, etc., was $21.55 per acre. The right proportions for the planting of the mixture are,—for every acre of corn, half an acre of horse beans and a quarter of an acre of sunflowers. The horse beans should be planted about three weeks later than the corn; and the sunflowers should be put in as early as the soil is ready.

A very few words must suffice in this address on the handling of milk in connection with winter dairying. Mr. Ayer emphasized this morning, what I merely allude to, viz., the need of absolute cleanliness. A good many people have fallen into ways of doing things that would not to themselves even seem permissible if they had not been accustomed to do them from their youth up. Let us be clean in everything and then we will have the finest of flavor in dairy products. You will find that a man who makes sure that he goes and washes his hands clean before he milks his cows will make his dairy farm pay better than the man will who does not do that. It is not that the money is made by that one act, but if a man believes in the importance of little things he will make his business successful. Most men fail, not on the main issue but on the little things.

In the furnishing of milk to creameries the farmers will realize larger quantities of butter than by setting the milk at home. I have had men say to me, "Is it possible to have good butter after the milk is whirled through the cream separator?" Milk from a deep setting pail, from cows calved more than 6 months, will on an average yield about two-thirds of the butter-fat and the other third stays in the milk. The centrifugal machine takes out all the cream. You have, therefore, from that kind of milk, three pounds of butter from the centrifugal cream separator method as against two from the ordinary setting method, and all the work saved in the home besides. But if to the milk of those cows that have been milking 6½ months the farmer will add the milk of a fresh calved cow, he will have much better results in creaming by the deep setting method.

We can in most cases keep far more cows if we will send the milk to the creameries than if we keep it at home. There is no trouble in raising corn in these days and no possibility of the ordinary farmer's wife, without suitable conveniences and time, making a success out of dairying at the present time, in my opinion. I am not saying this with a thought of depreciating home dairying; but this is the point I want to emphasize here: It is not practicable to get help in the country in the homes. That is you cannot hire domestics to help in the houses in the country. In cases where a farmer has grown up daughters, I believe they are excellently employed attending to the dairy when they understand the principles of butter-making and do it well, but the difficulty in most cases is that there is no chance to do it well when there is so much other work to be done besides. The upshot is that we have in Canada to-day the most appalling condition of many thousands of women living, so far as wearying toil is concerned, nearer lives of hardship without the ray of leisurely sunshine, than ever existed in this country before. There are all the exacting requirements of our social life, and the mother must have her children dressed quite as well as her neighbors, and her house kept just as clean. Then where is the time for that woman for leisure, if the burden of dairy work be added to the already too heavy load? Little children grow up and there seldom comes an hour when she can consciously sit down and play with them and instil into them by that means the gentler, stronger, greater aims of life than the getting of things. This winter dairying embraces the whole round of farm activity. From May to the beginning of the following October cheese and butter-making, and then from the end of October till the following May, butter-making exclusively—winter dairying and summer dairying—these include the whole round of dairy farming; and if the farmer will look after these things, keep his cows well and then make a product of the very best kind co-operating with his neighbors, he will find himself through dairying a richer man, a stronger man and a better man. Winter dairying will do more for the material welfare of the farmers than anything of which I have knowledge. It will result in making a people socially happy and so well up in making money out of their business that they can leave their children

better equipped to fight life's battles than they themselves were left. When we have winter dairying generally adopted, and through corn ensilage, horse beans and sunflowers, are getting the largest possible yield of the richest milk per acre as well as per cow, we will have harnessed the very sun of the heavens as the chief workman in our business, with ourselves as competent managers.

RIPENING CREAM.

Mr. JOHN BOYD, of Chicago, read the following paper :

The prime results to be sought in the ripening of cream or milk are the best possible flavor, an exhaustive churning and good keeping quality in the butter. How to obtain these requisites with the greatest uniformity is the most important question for the modern butter-maker to solve, and solve it he must in the near future or fall behind in the grand march of progress in the art of butter-making.

There is no step in the art so important or so difficult to accomplish as the preparation or ripening of cream, and no part of the operation has received so little attention from science or even from the army of practical butter-makers, each one of whom has his or her particular method, as varied as the hues of the rainbow, and each one has or thinks he has a good and sufficient reason for his action.

The strangest part of this whole business to the thinking man is the fact, not to be controverted, that they all or nearly all make occasionally fine butter, yet not a single one, be he ever so expert, is able to produce a perfect article uniformly.

They make a fortunate hit, all the conditions being favorable, with some of which they are as ignorant as the babe unborn, the grand result follows and they suddenly find themselves premium takers, that is, their butter is by experts pronounced perfect or nearly so.

Turn to the records of the great butter shows and you will find a confimation of this statement. Your mind at once reverts to the old adage, " lightning seldom strikes in the same place twice "

But, you say, there must be a reason for the success of the premium taker ; very true, there must be good and sufficient reasons for such a result.

It does not depend upon one condition but many, so numerous that they are difficult to trace and can be determined only after close observation and much patience.

My observation teaches me that the most important of these conditions are, the period of gestation in the cow, the food consumed, the creaming of the milk, the ripening of the cream or milk, and the churning and working of the butter.

The most successful butter-maker knows that there is a certain time in the process of ripening when his cream should be churned, and that if he churns before or after that particular time he fails to get the best results ; he knows that the process of ripening should develop a certain agreeable aromatic flavor, the quality most essential in butter, but beyond this he is entirely at sea.

To determine the proper time for churning, he depends upon his sense of smelling and tasting, and you all know how varied and unreliable such a test must be.

It is true some attempt has been made to determine the proper time for churning by measuring the degree of acidity in the cream. No good practical results, however, have come of this and none are likely to come, until the art of butter-making arrives at that state of perfection where the butter-maker can, with absolute certainty and within a given period of time, produce the necessary chemical reaction in his cream known as ripe cream, simply for the reason that the wrong acid may form and does form continually in the great majority of the work done in the creamery and dairy.

We all very well know that milk is affected in its taste and smell by the food which the cow consumes, and that this condition as a natural inheritance falls to the cream and butter. The scientific explanation of this phenomena and the best means of prevention are not by any means so clear.

My belief is that these conditions are complex and arise from various causes difficult to trace. Experience leads me to the belief that some of these effects in the milk caused

by the consumption of vegetables, such as onions, ragweed, cabbage, and other foods of like nature, are held in suspense in the milk in the nature of gas, and can be eliminated, while others are caused by the cows eating fermented foods, which are difficult if not impossible to eradicate, such as ensilage, clover hay, barley sprouts, rye, etc., etc , in certain stages of fermentation.

I contend that the aromatic flavor in butter is primarily owing to the condition of the cow as regards the period of gestation, that is, the aroma in butter is produced in perfection from the milk of the cow in the early period of lactation or before pregnancy has advanced, and can not be developed in milk drawn from cows in the advanced stages of gestation, the why and the wherefore I leave to the scientist—the master of chemistry, as by no means a mean study, but a foeman worthy of his steel.

You must not by any means imbibe the idea that the condition of the cow, or the process of ripening are panaceas for all the ills that butter is heir to.

Notwithstanding that all the conditions mentioned may be favorable to the production of the finest butter, the period of lactation all that is desired, the food consumed perfect, the creaming of the milk obtained by the most approved method, the churning and working performed by an expert, yet the finished product may be impaired by improper ripening of the cream.

The ripening of cream is due to the action of lactive fermentation, otherwise called microbes, bacteria, etc., etc. ; they are simply germs of ferment which grow and propagate with amazing rapidity in their proper element and temperature. I believe scientific research will very soon determine beyond dispute that the best condition in the cream is not attributable to any one particular germ or microbe, but to several, all however of the lactive acid species that are not antagonistic to each other, in fact, acting in unison, their office is to coagulate the serum of the cream and thus release the butter globules. The more perfectly this work is done—that is, the more completely the casein and albumen are broken down, the more exhaustive the churning and the better the keeping quality of the butter.

The old time theory industriously taught by some high in authority, that this work could be best accomplished by bringing the cream in contact freely with oxygen by frequent stirring, is now being disproved daily in numbers of our creameries in the United States, both east and west. My own work shows that much better work can be done out of contact with the air and without any agitation. The action of the ferment being governed by temperature rather than oxygen—in fact this is true of nearly all ferments, different ferments requiring different temperatures.

The lactive acid germ so desirable in cream ripening is easily killed in a moderately high temperature, and may be held in abeyance by refrigeration, for this reason cream that is sweet can be held for a considerable time without injury to the butter, if kept at a low temperature and out of contact with the air. In ordinary every day work this period can be prolonged by first raising the temperature and immediately lowering it again.

I am convinced that uniformity in ripening cream can never rely upon the ordinary methods in present use ; the process is subject to changes of temperature as variable as the winds, and the tests applied are good or bad owing to the physical condition of the operator. The operation delayed or hastened by accidents or circumstances over which he has no control, the cream is constantly exposed to odors of the surrounding atmosphere which it readily absorbs, the variable results of which are perceptible almost daily in the quality and quantity of the butter produced.

To remedy these defects I ripen my cream by a uniform method requiring a given length of time to produce the result desired, time not exceeding twenty-four hours, the operation is the same during all the seasons of the year, day in and day out regardless of storm or sunshine, heat or cold. The process is as simple as it is effective, and consists of making first a lactive ferment of sweet skimmed milk, taken from a fresh cow, this lactive ferment is placed in the cream in small proportion, in a cream vat made specially to retain a given temperature and out of contact with the air, the temperature in the vat being conducive to the action of the ferment, the consequence is it permeates the entire mass of cream and is as thorough in its action on the cream, although not as immediate as rennet is in coagulating milk in a cheese vat.

In common with rennet, the action of the ferment is retarded by agitation, so that after the ferment is added to the cream or milk and the vat closed no further care is required, the ripening is only a question of so many hours, thus cream separated at or about noon of one day is ripe the next morning by five or six a.m., and only requires cooling to the desired temperature before churning.

A VOICE: What is the temperature at which it should be churned?

Mr. BOYD: If it is ripened at a temperature of 65 degrees, then the cream should be churned at a low temperature—not above 56—but perhaps that is too low. The churning temperature depends on a great many surrounding circumstances.

Mr. AYER: I would like to ask Prof. Robertson, how much salt he uses at the dairy stations, and what he means by mild butter?

Prof. ROBERTSON: Seven eigthts of an ounce per pound for export, and from one to one and a half ounces for local customers. I would count five-eights of an ounce of salt to a pound of butter very mild. But let me ask Mr. Ayer the question, how much salt he finds the customers in England want put in creamery butter?

Mr. AYER: I think the best results are obtained by using three-eights to three-quarters of an ounce of salt. In some sections they would call it mild if it had three quarters of an ounce, but in other sections they would not call it mild unless it contained under half an ounce. But I am afraid we have not got what they call "waxy" butter The Australians have got that to perfection.

Mr. MADDEN: What kind of salt would you recommend?

Mr. AYER: I am not in the salt recommending business. I am not advertising anybody's salt just particularly to-day, but I have found Ashton & Higgin's salt all right when it did not come in contact with any bad flavor. There may be local salts satisfactory.

Mr. SWITZER: How would you distribute the sunflowers through the feed?

Prof. ROBERTSON: Cut the sunflowers with a common hook and throw them into heaps. We have had a little trouble in mixing them well. If you have a wide mouthed cutting-box you can do it. I have not had much experience of this, but quite enough to know that it comes through the cutter thoroughly mixed for the cows.

Mr. G. S. JOHNSTON: I would like to know the quantity of sunflower and bean seed required per acre?

Prof. ROBERTSON: Where the beans are grown alone, two-thirds of a pound to an acre. Where there are sunflowers, three pounds to the acre. It is better to have plenty, and thin them with the hoe after they come up.

Mr. AYER: What about the blight in beans?

Prof. ROBERTSON: They are subject to blight if put in too early. Up our way, if they are put in about the middle of June they do not suffer from blight.

Mr. AYER: Speaking of salting for export, a large proportion of the English butter has scarcely over a quarter of an ounce of salt per pound. As to testing butter, when I went to Chicago I was of the same opinion as Mr. Boyd, and began to judge by smell, and thought there was no taste at all, but I found that the gentlemen who were judging with me had advantages over me. I probably did twice as much judging as they did, but they found out things which I could not. I could get all the flavor of nice butter without tasting it at all, but when it came to testing butter that was not up to the mark I was at a loss. The constituency was in some respects different there from what it is here. What I mean is this—the spread was less there than in Canada. Butter that they would score about 96 points there would score about 93 points here; butter that would score about 95 there we should mark about 92; butter they mark 90 we should mark about 82. They use the points more freely. They use half points when we use points, up or down, as the case may be. I claim they were as fine judges as I have ever seen. We tried to keep out noses perfectly clear, and whenever more than one of us had his nose not perfectly clear we quit judging for that day. Now,

to show whether we were right in our judgment or not, when we began to strike in on a fresh State, the third day, we went back to the first day's butter and kept our scores aside. In most of the cases we scored exactly the same again. We scored the same lots of butter over again, and I have to say there is something, in my opinion, in a man using his mouth to judge, but I want to use my nose first. I simply applied my mouth to correct anything I had misjudged up to that point. I simply give you that to correct, or to add to, the remarks which the gentleman has so well made with regard to the judging of butter. The nose should be applied in the majority of cases, but there are cases where the nose won't do it all, in my opinion.

Mr. HANNAH: Would the waxy butter Mr. Ayer spoke of be the butter for Chicago or English market? Two years ago waxy butter got the prize at Toronto, a year ago it was not waxy butter that got it. What would be the constituency in Chicago or on the other side? Would ask whether you would have it worked just solid enough to give it a waxy appearance?

Mr. BOYD: I have peculiar ideas on that subject, and I do not suppose everybody will agree with me. The waxy condition of the butter comes from the cow and not from the maker. That covers the ground I spoke of in flavor.

Mr. GRAHAM: Don't you think the working of butter will have something to do with the texture of it?

Mr. BOYD: Well, no; not if it is worked properly. However, that waxy appearance in butter comes from the cow, in my opinion, that has been long in lactation; and the reason you failed at the World's Fair was, not that the butter was not well made, but that you had no fresh cows. I also believe that if you go into winter dairying you will make a superior quality of butter and not suffer in your cheese, because the flavor in the cheese comes from the same source that the flavor in the butter does.

Mr. AYER: I know what the Philadelphia, Boston and New York markets ask. I found in discussing this question of waxy butter in Chicago, that they understand it altogether. We mean by a waxy butter, one in which all the water is expelled, and which you can twist and it will hold together in a body. As to Mr. Hannah's question, when we are judging butter in Canada we have our thoughts on the market where the butter is going. Most of it is made for export. Perhaps the gentlemen who judged last year were judging for the local market or for their tastes at that time. My opinion is that we should judge for the largest market. For instance in our judgments at Chicago, where the butter was labelled for the Boston market, or Philadelphia market, or Chicago market, we were bound to judge it as such. The main trouble with our Canadian butter was style and appearance. We were "not in it" with the Americans for the top and finish of the package.

Mr. BOYD: What season of the year do you find that this waxy butter predominates?

Mr. AYER: In our Canadian butter as soon as we get our cows on to grass and all through until we strike frost. I think in Canada our June and September butters are the most waxy.

Mr. MOYER: What I would say is that this waxy butter was much affected by the working.

Mr. HANNAH: I would like to have Mr. Ayer's opinion with regard to this.

Mr. AYER: Do not misunderstand me. I do not say butter could not be worked properly by machinery, but my experience has been very unfortunate with respect to machine worked butter. I have handled five out of a half dozen lots east of Toronto that have not proved satisfactory.

Mr. BOYD: With us hand-working would not be practicable at all, with the quantities of butter we work, and I do not see why a good hand-worker could not be as careful and successful in working by machinery.

Mr. FARLEY: I have a cow which I consider a good one. I have had her six or seven years and every year she was a good milker. This year she was dry for four

months, and at the time when she went dry was giving four quarts. The second last time we churned from her we churned about two hours before we got butter, and the last time we churned we could not get butter at all. I would like to know the cause of it.

Mr. BOYD: That is a constitutional defect in the cow; but if I had a cow that would go dry four months of the year I would not milk her again at all.

Mr. MALLORY: I understand the patrons at Wellman's Corners were charged 3½ cents per lb.; was that the actual cost of manufacturing or did it include anything towards the first cost of setting up the factory.

Prof. ROBERTSON: That was not the price at Wellman's Corners alone, but the average of three factories.

Mr. MALLORY: Including the cost of the building.

Prof. ROBERTSON: Yes, I think 3½ cents will pay the manufacturer after paying for the factory and furnishings. The patrons drew their own milk.

Mr. SWITZER: Down at the Napanee factory the proprietor took 12,000 lb. twice a week during the summer, and then, I think, 5,000 lb. towards the end of November. After having paid his butter-maker he reports a profit of $40. It seems to me that would be a small remuneration.

Mr. BROWER: Relative to the cost of cheese and butter, so far as that goes, during the last four months we have realized much better than that on cheese.

Prof. ROBERTSON: I do not want to have a single ghost of an idea go abroad that butter-making is in competition with cheese-making, at the same time, this present year I think we will pay $1.05 per hundred lb. for milk besides returning all the skimmed milk. The point I want to make is this, that while a few factories may carry on cheese making for the profit of cheese makers after the 1st October, we should not encourage cheese-making after the 1st October for many reasons. The cheese made after that time is not the kind of cheese which gives us a reputation abroad, while the kind of butter we can make then is the kind that will give us that reputation. I think the 3½ or 4 cents will pay butter factory owners after a few years. It may not be the case that it will pay very well at first. Neither was it so with cheese at the start.

SECOND DAY.—EVENING SESSION.

This was the most largely attended session of the Convention, and, indeed, one of the best attended in the history of the Association. The city hall was taxed to its utmost to accommodate the audience which assembled. Mayor Wallbridge occupied the chair, and the proceedings were interspersed and greatly enlivened by some excellent instrumental and vocal music, contributed by the Riggs family orchestra, Mr. Frank Lewis, Miss Price, Mrs. Helen Campbell and Mr. McIntosh, all of Belleville.

ORGANIZATION AS THE BASIS OF SUCCESS.

Mr. J. W. WHEATON, of London, was the first speaker, and had for his text the above heading. He said: Organization means a unity, or system of uniting, for one common object, and success in any enterprise in which a number of people were engaged depends upon organization. Indeed, the success of an individual depends on organization, and unless he looks to this he is not going to make a success of his business. The business man has to organize his efforts in some systematic form if he is going to succeed. The farmer must organize if he is going to make the most profit out of his business. Then the dairyman, more than either of the others, must organize his work, so as to keep a better herd of dairy cows. He must organize in the care and keeping and feeding of his cows; and I think herein many of our dairymen could improve. So much for the individual.

Now, with reference to the cheese factory and creamery, success there also depends upon organization. I might say, in this regard, that in many of the cheese factories—I speak of cheese factories more particularly, because I have been more engaged in the work pertaining to them—the work is not carried on as systematically as it ought to be, and consequently they are not so successful as they might be. In this connection I would just like to throw out a few suggestions with reference to co-operation in this industry—that is the co-operation of factories. We claim that the success so far has been due to co-operation. Now, I think the dairymen ought to extend this co-operation, for different reasons. If a number of cheese factory patrons within a district of ten miles square would co-operate to carry on winter dairying, that would be the cheapest way to carry on a creamery during the winter and do it successfully. Then, another matter, is paying for milk according to its butter-fat value. In Western Ontario last year some fifty factories paid for milk according to this method. At many of the factory meetings which I attended to give information, with a view to securing the adoption of this system, it was said the patrons of one factory would not adopt it until those of some neighboring factory did so. That is not right. If the principle is correct one factory should adopt it irrespective of what another factory may do.

There are other ways in which cheese factories might co-operate, and I might mention one—that is in reference to the disposal of the whey. That is a very important factor in connection with a cheese factory. We found many factories in the west pulling against each other in this respect. One factory adopts the plan of sending the whey home in the milk cans, while another uses it at the factory, etc. Now, if it is wrong to allow the sour whey to go back in the cans, why should not all the factories co-operate on the other plan. If they would do this they would make a greater success of the business.

I have a few other points on which the factories might co-operate, but I want to pass on to the larger phases of organization—that is, unity for one common object; and in this regard to refer to work that associations of this kind have done and are doing to promote dairying. An organization such as the Ontario Creameries' Association, is an organization in the wisest sense. Here the creamery men meet for one common object—to promote the work of the creameries. I may say that the success of our butter in the past has been due largely to the work of this Association. Many of the dairymen cannot recognize this, but directly and indirectly it has been due to this Association that we are turning out the fine quality of butter we are doing and exporting such a large quantity of it.

Just to give you an instance of the importance of an organization in connection with this movement, in the summer of 1891, I was in the Province of Nova Scotia, under the direction of the Dominion Dairy Commissioner, and visited the factories there and talked a little to the dairymen; and in my travels through that Province, I came across a number of cheese factories that were built about twenty years ago which were not in operation. They had been built at very great expense and had run only three or four years. The business was not a success. The people who put their money into it lost it all, and the patrons lost all the milk they supplied. The reason, I think, why they failed then was because they did not form an organizatian for the discussion of their mutual difficulties. The year before I went to the Province they had formed an association and started work again, and I have no doubt the dairying industry will thrive and grow in that Province.

Now, as to the work which associations of this kind have done. They have been able to accomplish many things. Through the influence of these associations we have been able to secure laws against defrauding in the way of sending adulterated milk to cheese and butter factories. The associations have been the means of educating the manufacturer as to better methods in carrying on his business; of educating the maker in better methods of making goods, and of educating the patrons in better methods of keeping stock, of providing proper feed for the cows and of caring for the milk.

Now, an association of this kind should endeavor to look after the interests of every one connected with the dairy business—that is the manufacturer, the maker and the patron—and should be able to give them information as to the best means of carrying

on their several branches of the work. The cheese-maker and the butter-maker should be looked after, and, if they get into difficulty, should be provided with help. It is important that inspectors should be provided, to give the best information possible in reference to making the finest quality of cheese and butter.

Now, that is all I intended to say in reference to the Association, but before closing I would like to make an appeal on behalf of this Association. I find the same difficulty in connection with all these Associations, of getting dairymen to take hold of them. I have had many men say to me, "I will join the Association if you will show me the good of it." I always reason in such a case on the lines of the old proverb, "Ephraim is joined to his idols, let him alone." Among the inducements to become members it may be mentioned that the reports of the three dairy Associations are united in one volume, containing all the addresses and discussions of the annual conventions, and members are supplied with these. Then we arrange for members to get copies of all the governmental reports published at Toronto and Ottawa bearing on these subjects. But there is a higher motive than this for becoming members. Dairymen should join an organization looking after their own interests, and if they would join they would not be only helping us financially, but we would feel that they were desirous of stimulating the work we are doing. They would encourage us and help us in that way.

RIGHTLY EQUIPPING THE BOYS FOR THE FARM.

Prof. C. C. James, Deputy-Minister of Agriculture for Ontario, was received with loud applause on rising to address the Convention on the above subject. He said: A short time ago one of the Toronto papers made a statement to this effect: The agriculture of Ontario has been developed to such an extent that our Governments ought to call a halt and develop some of the other industries—that we have reached the limit, so far as our agricultural resources are concerned. I have nothing to say about the developing of our other resources, but I would say to you that the statement in regard to agriculture is far astray. There is nothing that can be advanced to back up that statement.

Now, before I begin my subject, I want to make a remark or two with reference to the agriculture of Ontario particularly. The agriculture of Ontario is the foundation of our material wealth. Without it we would have nothing; without it we would be nothing; we are very far from having reached the limit of our agricultural development. We have in the Province of Ontario invested in agriculture—that is including the lines belonging to agriculture—such as the stock and implements of our farms, about $1,000,000,000. In the manufacturing industries of the entire Dominion we have invested about $350,000,000. Thus in agriculture in the Province of Ontario alone we have about three times as much money invested as we have in the manufactories of the entire Dominion. The agricultural products of Canada amount to $500,000,000 per annum; the mineral products to about $20,000,000, and the fishery products to about $19,000,000. I have not the figures for the timber products. Now, these four items represent the four great sources of wealth in this country—that which comes from our soil in the form of agricultural products; that which comes from the mines, our timber and our fish. The figures which I have given show quite conclusively that we have not only a great deal more money invested in the agriculture of our country than in any other industry, but that the outcome exceeds by far that of the others put together. Our agricultural exports are about half the entire exports. Our lumber exports amount now annually to about 15 or 16 million dollars. Our cheese exports last year amounted to about 13½ million dollars. So that one item alone has come up almost to the entire exports of timber.

The latest census bulletins tell us that we have in this Dominion workers in the various occupations to the number of 1,660,000. Of these 735,000 are engaged in agriculture, about 45 per cent. In this connection I want to give you a figure or two. If you can have reference to this census bulletin, entitled "occupations," you will find the figures given by Provinces, and you will there, perhaps, be surprised to find that while in Manitoba and the Northwest, during ten years, they had an increase of nearly 29,000 workers engaged in agriculture, we had a decrease in Ontario, Quebec, New Brunswick,

Nova Scotia and Prince Edward Island of 36,000, showing a decrease of more than 7,000 for the Dominion as a whole. This brings us face to face with this question: We have here the industry which gives our largest percentage of exports, the industry in which are engaged the largest number of our workers and in which the greatest amount of our capital is invested, and yet in this Province of Ontario and in the neighboring provinces during the last ten years we have had a falling off in the number of workers.

Now, I take it, as agriculture is the foundation of our wealth, as a matter of very great importance that the workers engaged in that occupation shall not fall off more and more, but that it shall be developed more and more from year to year, and especially that the persons engaged in it shall be as well qualified as possible under the circumstances. So much for the importance of this great undertaking in which we are concerned to-night, and of which this dairy association forms a very important part.

Now, some one may say an audience of this kind has very little interest in the subject of dairying. You are mostly city people I presume. You know the old saying that one of the most important things in connection with trade matters is to bring the producers and consumers together. Well, we have here to-night the producers and consumers and this is a subject in which we should all be interested. As we look over this province we find that that peculiarity of older settled countries, viz., that the crowding of the people from the country to the cities has set in and is going on at what most people would call a rapid pace. If we go to the old countries of Europe we find the cities taking in hundreds and hundreds of thousands. Coming to the United States we find the large cities growing much more rapidly than the rural constituencies. And here we find just the same great movement going on—the young men and young women crowding from our rural districts to our cities, and concentrating themselves in our great centres of population. Is it a healthy thing in a community to have a centralization of thought and wealth?

There are three forces that are drawing our people from the rural districts to the cities. I am speaking to some who have felt this. I have put these under three heads—financial, social and educational. The young man in the country has the idea—mistaken, it is, of course, to a great extent—that there is more money to be made in the great cities than in the country. A few years ago the statement was made that a young man had a far better chance to make a living in the city than in the rural districts. That statement was challenged. Those who challenged it said "let us take the city of New York," and an investigation of the earnings of young men in that city was instituted. What was the result of that investigation? It was found that only 60 per cent. of the young men engaged in business in the city of New York had been able to rise to a salary of $1,000; that only 12 per cent. had risen to a salary of two thousand, and only 5 per cent. had gone beyond that amount. Now, when we remember that in New York the cost of living is double and treble what it is in the rural districts here, we find that these figures prove how hard it is for those people to eke out a livelihood. A young man comes to town and sees a doctor driving in his rig. The doctor has a good horse, a good buggy, and dresses like a gentleman, and the young man at once forms the idea that there is a man who is making money. We cannot always judge by appearances, and very often those men, who are compelled to put on a good exterior, find the very greatest difficulty in making ends meet at home. The same young man steps into one of our court rooms and there sees a man standing up and defending some noted criminal. The man puts his case very cleverly. He too is well dressed. Perhaps he gets a large fee for that bit of work; and perhaps the young man goes home and says, "these lawyers are the men who are making money; I will go into town and become a lawyer." He sees a business man building up a very large business, and he says "I will become a business man." All the way through he builds up his whole case upon these two or three exceptions, and says "because these men have gained a high position in the general estimate of the country, therefore the profession to which they belong is the profession at which I should aim and towards which I should bend my efforts." Then he goes home. Perhaps he goes to a home with a mortgage on it. He goes to a home that is not very well furnished. He goes to a home where hard work from early morning until late at night is a necessity. He goes to a home perhaps where there is more drudgery than you could find in any home where people were engaged in almost

any other occupation. Holding up before him, on the one hand, the work on the farm, and, on the other hand, the bright future presenting itself from work in the cities, he at once decides that he will leave that dark side of human life in the country and go forth to that brighter side of life in the cities. That, I consider, is one of the great influences drawing our young men from the country to the town. The statement has been made in our own city of Toronto that there are fewer failures among the farmers than among any other class of the community; that on the average there is more money made, man for man, by our agriculturists than by the representatives of any other class.

What we want, right here, to meet this objection, is to place agriculture and dairying on a sound business basis. But some say dairying is not to be classed with manufacturing at all; it is not to be put on the same business basis. Let us ask ourselves just a question or two along that line. A farmer produces 20 acres of wheat. Where does that come from? Out of the soil and out of the air. By the peculiar manipulations through which the farmer puts the soil, and through the action of the gases gathered by nature from the soil and atmosphere, the little plants have been picking up nourishment and working themselves into that which the farmer threshes in the form of wheat. He puts that grain in bags and takes it to the miller and the miller puts it through a process which converts it into flour. We call the miller a manufacturer. If we term a manufacturer the man who has put that wheat through that comparatively simple process, much more ought we to call that other man a manufacturer, who, out of the atmosphere and out of the mysterious ingredients of the soil, produced the wheat from which the flour was made. He is in reality much more a manufacturer. The changes are far greater in his hands than in the hands of the miller; and if the one can reduce his work to a business basis, the other ought also to bring his work down to a business basis. So we might go on all the way through with reference to the turning over of the hay and straw and changing them into milk, and butter and cheese. We might take up the production of wool; and surely in that respect the farmer is equally to be classed with the man who takes that wool and manufactures it into cloth. My contention is that agriculture ought to be conducted on a firm, sound business basis, and until that is done the farmer has very little hope of making much beyond a mere living in this world. Some one has said there is no other line of business that will stand the financial strain that farming will; that to a great extent our business is made up of hard work and ignorance, and there is no other business that would stand the reverses, that would stand the ignorance that our business does.

Now for the social reasons: a young man leaves the country and goes to the school of the towns. He goes to a home, perhaps, that is not much better furnished than the one he left. But he gets more entertainments and that heterogeneous and sometimes misunderstood part of human nature, the inclination, is transferred from rural to city life. How are we going to meet that? There is an old story, which no doubt many of you have frequently heard, but which I think will bear repetition. We are told in ancient mythology that on the shores of the Mediterranean there were sirens who discoursed music so enchanting that sailors who passed that way could not resist turning in although they knew the dangers of the coast were so great that all who did so were lost. We are told that Ulysses, in order to avoid these dangers, was compelled to seal the ears of his sailors with wax, and tie himself to the mast. But another sailed along that way—Orpheus by name—and instead of following the example of Ulysses he had discoursed upon his ship music so far superior to that which the sirens played that theirs had no attraction for the sailors, who thus avoided the dangers of that destructive coast. Now, we have had brought before us, in the newspapers and otherwise, the fact that there are social allurements in connection with the towns and cities that prove too strong for our young women and men, and bring them in from the country, not to their improvement, but, very frequently, to their destruction. If this social life of the towns has proven so strong in the past the only we can meet it in the future is to make the social life of the farmer's household and rural district as attractive as that of the town or city. I have not time to go into details as to the methods of brightening the rural home and rendering it more attractive and more comfortable. The farmer has that to a great extent in his own hands. He can so locate his house as to have a pleasing outlook; as to have it well drained; and

as to get plenty of sunshine and pure air. He can furnish it in a comfortable manner—not an extravagant manner—and he has this further advantage, that by the aid of a garden properly kept he can enjoy fresh food such as those in our town and city houses are entirely ignorant of. He can supply his house with literature, the books and papers referring to his own work. But, instead of this, what do we frequently find? We find in the rural home too often a city newspaper—a political newspaper—and nothing else. These papers are very important. They should be found in every farmer's home, but they should not be the only papers there, because we know that if they are, the attention of our young men will be fixed upon and their ideas regulated by those events which are constantly happening in our cities. First of all there should meet the eye all the agricultural papers, of which Canada has her fair share, and which take rank not second to any published on this continent. There should also be furnished the political papers, because I believe farmers should be informed as to the affairs of the country as well as those who live in the towns and cities.

What I have said will apply to the father on the farm perhaps more than to the young man. We have here to-night young men who are gathered from the rural districts. The first thing is to choose well what line of work we are to go into. Someone may say, "well, we have not got very good material in the country for development." Have we not? Where have the best lawyers come from; the most successful doctors; the greatest business men; the most eloquent ministers? Go through the lives of the most successful men in the towns and cities and you will find that the majority of them have come from the country; and they are coming yet. There are just as good young men in the country as there ever were, and there are young men there who will make first-class farmers, or perhaps second-class lawyers, or doctors or preachers. You have heard the old saying about giving a $5,000 education to a $500 boy. Well, that is frequently done. Many a young man, by a system of warping and twisting, is driven off into the town or city, perhaps to make a wreck of his life. I want to say that this stream ought not to be stopped altogether, or our professions would run out in two generations. (Laughter.) That is no reflection upon anyone. It is because on the farm there is developed a physique and a constitution by hard out-door work, which is essential to the study of a profession. Too frequently young men in the cities start out rather handicapped in that direction. But we should, at the outset, choose our occupations carefully. You have heard the statement attributed to Sidney Smith, that the world is like a board full of holes, square, round and triangular, and that the human race is like a lot of pegs, and that it is only when the square pegs get into the square holes that success may be expected. There was a business man in New York one day reproving an understrapper for something which he had not attended to properly. The latter retorted, "Oh, well, you were only a drummer boy yourself, once," and the man turned on the boy and taught him a lesson. He said, "Well, my boy, didn't I drum well?" You see, he was not ashamed that he started life at the foot of the ladder, and the answer he gave was that because he "drummed" well—because he did well at the foot of the ladder—he was able to make progress. Some young men in the country are like those in the towns. They rather under-estimate the importance of the foundation of their work. I do not know whether we consider what we call chores the foundation of our farmers' work. Here is a young man who has to do the chores. He does not like it, and he goes about his work in a careless, shiftless, listless sort of manner. He thinks poorly at the bottom and does poorly all the way up. But here is another young man on the farm. He takes an interest and a pride in the stock he is feeding. Perhaps his father says, "now, you and I are going to be farmers together; I am going to throw the responsibility of caring for that stock upon you, and see whether you do as well as I have done." That young man is at once thrown upon his own resources; his pride in his work is aroused; his interest has been set on fire; he has an interest in that work which is not to be killed, and that which seemed to him before a burden now becomes the pride of his life, and, after a time, as he watches the result of his work, he begins to say, "well, I do not think I have done so badly; I think I can hold my own with the old man yet." That arrangement has aroused the interest of the boy, and by beginning at the bottom thoroughly, that interest gradually works up and extends until the fields begin to look

cleaner and the fences do not look so straggling ; the stock has been better kept ; the products of the field are better housed ; they are increasing in quantity, and the boy begins to look around. He has now become a man. He picks out this successful point and another successful point, and says, "I must and will have as good a farm as my neighbor ; I will have a better farm ; I will have the best farm in the county ; I will have the best farm in this Province." And so it goes on, and by stimulation in that way the young man will arrive at a success that few in our towns and cities achieve, and in old age will feel that he has had a good living ; that he has influenced his neighbors round about for good ; that he has been free, and has lived almost, we might say, like a king.

A point which I think comes home to every one is the importance of thinking well of one's own work. You meet a man on the street and ask him how his work is succeeding. His looks tell you all about it. He carries an air of dejection. That man thinks there is nothing in farming. It is the last resort. It is the occupation to which a boy should be put who cannot make a lawyer or a doctor. Here is another man who walks along the street with step as firm and body as erect as any business man in your city. Would you dare confront that man with the statement that agriculture is a low business? The man who thinks well of his work will be well thought of. Our work is what we make it ; and we are estimated in our work just as we estimate it ourselves. If we take home that one thought and ingrain it into our lives we will make our work respectable ; we will consider it respectable, and if we hold it up as a model of respectability then agriculture will have made vast progress in this country.

My last point—A painter, after a long period of hard work, had produced a picture, a work of art. After it was done it looked so easy of accomplishment that it hardly seemed to be the result of much pains or effort. One of his friends who was jealous of his success turned to him and said, "With what did you mix your paints?" The painter calmly turned to him and said. "I mixed my paints with brains." Now, if agriculture is to be a success in this country—if the young men who are to play so important a part in the agriculture of our country—are to make it a success, they must see to it that the field is plowed, that the grain is reaped, that the milk is produced, and the butter and cheese made, by mixing with their work a liberal allowance of brains. Agriculture demands of us that we shall have at the present time and in the future, not simply what brains may possibly be left on the farms after the professions have been provided for, but the pick of the brains of the family, and that it shall have in this connection a fair chance with business and the professions. It demands that the best brains now produced on our farms shall be retained there, and shall be trained to agriculture, and, if this is done, I think the future of our country can be safely left to our agriculturists, who are principally responsible for its true success. (Loud applause.)

EDUCATION IN AGRICULTURE.

Mr. Andrew Pattullo, of Woodstock, was again introduced, and said : We read in the good old book to which we all go, or ought to go, for our comfort as well as direction, the advice once given when some one presented himself to the king, that his words ought to be few and orderly. You know in these days of democracy that the king is the people. I often feel in appearing at these meetings that the advice is applicable at the present time, and I am rather sorry that I have been scarcely able to follow that good advice this evening.

We have heard something to-night on the subject of education. You know this is said to be the age of education. This afternoon I was speaking on a subject in which I have taken some interest, and showed that although we think we have advanced in some directions we have not done so with reference to the particular one of which I spoke. I was referring more especially then to the art of road making, and showed that the people of Egypt in its palmiest days were probably able to build better roads than any built since ; and I was endeavoring to point out that if we want to have the most accurate

standards of civilization applied to ourselves we had better begin to educate ourselves again on the subject of road making. I am not going to refer to that question further now than to say that we have in this matter not only the ideals of the future to press forward to, but the standard of the past to compare ourselves with.

I have listened with a great deal of interest to the remarks which have been made on the subject of education, and I am not going to cover the ground again. The last speaker has said a great many things to which it is unnecessary for me to allude, but there are a few matters which I might mention merely as an addenda to his remarks. I am a thorough believer in education. I am one of those boys who unfortunately left the farm—because I had no farm on which to stay. (Laughter.) As one of the boys who has left the farm, I thoroughly appreciate the good advantages of education. I do not want you to carry away the impression that there is any danger of too much education in this country. I do not think we can ever get too much education if we get it of the right kind. I never met a man who knew too much, and am not likely to; but I have met a good many who thought they knew a good deal more than the public gave them credit for. (Laughter.) I believe in an elementary education, such as will fit a man for the intelligent exercise of the franchise, but I do contend most seriously—and it is most important to remember this—that there is a danger of the education of the country being in the wrong direction. Now, I think, in reference to higher education, that with our high schools, collegiate institutes and university, we are not only in danger of spending too much upon education, but of spending it in the wrong direction. When you want your sons to attend a collegiate institute you should have clearly in your minds what you intend to make of them. If you are farmers you ought to clearly define ahead what you are going to make of these boys. If they are to be artizans they should be educated to make their work successful in that direction. If they are to be business men they should be educated with a view to business; and if to be farmers, then you should educate them for the farm. And I say it is a mistake—an injury often—for boys to be educated in classics and some of the other studies which create ideals that they can never carry out—their parents never thinking of the occupations which these boys must necessarily engage in for the remainder of their lives. The result of this is that we are having too many unsuccessful professional men in this country and too few successful farmers. I believe there is a future for the boys on the farms of Canada, and for that reason I believe that the agricultural colleges of this country are engaging in the most useful kind of work at the present time. I am not going to make any criticism as to the management of these institutions. It is the privilege of every man, woman and child in this country to criticise. I am not speaking of the men who manage these institutions, but I contend that the Ontario Agricultural College is, perhaps, to-day, the most useful institution in all this land; and what I say with reference to it applies with equal force to the Experimental Farm at Ottawa, and all the other experimental stations throughout the country. Now, I am coming to the point. I say if you want to educate your boys to be agriculturists, do not send them to an institution which will lead them away from the farm so that they will never think about it, but send them to those institutions which will teach them how to farm intelligently and successfully, because unless your boys can farm successfully you cannot get them to stay on the farms. So, in this way you see the enormous importance of these institutions, not only to the agricultural interest, but to all the interests of this country.

Now, just one thing more. All the agricultural education is not being done by the Agricultural College, nor by the institution over which Professor Robertson presides. It is being done also by the farmers in the organization to which Mr. Wheaton has referred. The whole idea of this organization is the self-education of the farmer. You know that, after all, what we learn at school is a mere trifle. Unless we are learners all the way through we will fall behind, in these days when competition is so keen; and there never was a time when it was so necessary for the farmers to keep plodding away, not only in connection with the work on the farm, but in connection with all the interests in which they are concerned. And what is the result of education? The result of education is simply success in life. There are few people who can be everything. It is said in the United States every boy sets out to be President. That puts in the boys

the ideal of the politician, and I do not think that is the highest ideal of any man, in either that or this country. You will see in this aim for the Presidency all but one fail to reach the ideal. There is a very much greater area of disappointment in that respect than there is of satisfaction. So, you see, when boys start out with wrong ideals they are apt to be led in directions where they are simply making a waste of time and opportunity. Now, gentlemen, why is it that it is so hard for farmers to make a living at the present time and so necessary for them to keep up with this age of progress? Simply because the area of production has got to be so great and the appliances of the age so expeditious that the supply of many products is greater than the consumption. Therefore the object of the farmers and the farmers' sons is to know how to produce those products which the world demands, to know how to produce them at the least cost, and how to produce those products which will get with the greatest facility into the markets of the world. Some of our farmers are selling wheat when it would pay them to convert it into pork; when, if they would follow the teaching of the men who head our Agricultural Colleges, they would be producing finer butter and more pigs—products which the world wants and which you can produce at a large profit.

Now, gentlemen, just one word in conclusion. I would say that, not only is agriculture the great industry of this country, but the farmers are the masters of this country whenever they decide to be so. In the management of the affairs of the municipalities and particularly in the part which they ought to take in shaping the destinies of the country, the farmers as a class of highly educated men in the very best sense of the word will exercise that benign influence on the country which is for the country's good.

WHY DID NOT CANADIAN DAIRYMEN TAKE ALL THE PRIZES AT THE WORLD'S FAIR, CHICAGO?

Prof. ROBERTSON was introduced to address the Convention on the above subject, and said:—"Why did not Canadian dairymen take all the prizes at the World's Fair?" That is I suppose put to me as a poser. Why? Well, because we did not want them all. (Laughter.) We do not all belong to Brockville and have not all got Brockville's spirit yet. (Renewed laughter.) Then we could not have got them all if we had wanted them, and being largely common-sense in our attitude towards things, we might as well be content without them. I may say, without palaver, we did not deserve them all, and that may be because we are not all so good and able as the people of Brockville. In coming before this Convention I feel the somewhat peculiar embarrassment that bothered a clergyman who came to Ottawa on one occasion. He was asked to preach to a fashionable congregation. He looked down the aisles of that church, and I think had a rather dim suspicion that even in Ottawa things were not wholly what they seemed. Then he said "My duty is to preach the old gospel of repentance and a better life, but you seem so eminently respectable that I fear you are well satisfied with yourselves now." (Laughter.) When I speak of these attainments at Chicago I find most Canadians are content with what we got. I know there are a few who limit their interest to the medals and diplomas we are getting, but that is because I think they fail to perceive all the advantages of the Fair to our vast country.

Our neighbors to the south of us gave us a magnificent opportunity to put before the rest of the world an exposition of our attainments and resources. It was a spirit of generous hospitality which invited us to go to a big "at home" of nations and show our best. Canada went there with that object and did herself a fair amount of credit.

I was trying to think of the best exhibit I saw. I saw those splendid buildings, of such architectural beauty as angels might build. The White City looked to me as though the very finger prints of God Himself were on the magnificent symmetry of its buildings. They were comparable to the Rocky Mountains, or the St. Lawrence, or Niagara Falls more than to structures of wood and brick and mortar, They were indescribably grand;

but they were not the best that was there. That chiefest excellence was the courteous, cultured good nature and conduct of the crowd who thronged the grounds. The best thing there (next to the Canadian dairyman) were the Americans themselves. We are here to live alongside of that great Republic, and to live alongside of them as a separate people, I hope for all time to come. (Applause.) But at the same time we should not shut our eyes to the attitude and action of those people. Do you suppose the earth or sea can say to the moon, "I will have nothing to do with you?" Why do the tides rise and fall? A man who has a boat may get out into the ocean and float on its surface. Then the moon simply lifts the whole ocean a little towards itself and lets it back again—with the boat and its occupant. We cannot help the influence of that mass of matter, or this mass that bathes our shores. We have been rather hurt by the mass of people in the United States sometimes being swayed by unworthy motives towards us. There was a time when we and the people to the south of us were within one nation as we still are brothers in race, language and main aspirations. Then a family quarrel came, which was bitter and lasting; and the quarrel of the last century is still a gaping wound with some people. But the mass of the people who live to the south of us are kindly disposed towards us, and at the World's Fair, when they saw us as we are, their papers and public men gave us credit in speaking of us as we are, and commenced the formation of a wide-spread sound sentiment of friendship and appreciation towards our people better than that which existed before. We ought to live as neighbors who respect each other, but never think that it is necessary to live under the one roof or in the same room because we are good friends.

One thing more we got. We are a young people. A nation grows like a boy. How does a boy grow in ability and capacity? He is fitted for the task of the now, because he has all the past as his patrimony. Even David, without the experience of leaving a slain bear and lion on the hillside of the home farm behind him, might have grown timid and nervous, and run away from the fierce presence of Goliath. But, with the memory of the vanquished enemies of the herds and flocks which his single-handed prowess had defended, he had courage to meet and slay Goliath, the great foe of his nation. Do you suppose those Britons who fought the French on Waterloo were not encouraged and strengthened by the feeling that they were fighting for the freedom and liberties of the civilized world? Such be the impressions which lead men to say liberty is better than life; and the British soldiers went to Waterloo not to vanquish Napoleon, but to keep the freedom of their own hearthstones intact. And because we have such a glorious history as Britons we have courage as a nation to be strong—to be and to do. So it is in the case of a boy. Someone says "Well done, Jack," and Jack does better next time. Since the results of competitions at the World's Fair have become known all the Europeans and Americans have kept on saying "Well done, Canada," until every Canadian goes to his work feeling more and more assured that Canada is a good country and that she has good sons. That is one way, I think, by which she has been getting a good deal from the Exhibition.

Then, Canada is like a very shy girl. We have not been given to boasting of ourselves very much. We have been given too much to thinking that those far-off mines are filled with better metal than our mines; that those distant hillsides are greener than our mountains, and that the trout in the far-off streams are bigger and gamier than ours. We have got a capital lesson from Chicago that we have much to be proud of, no cause to be faint-hearted, but, on the contrary, that we have every reason to be courageous. More than that, we have received considerable stimulation through this Exhibition to arouse enthusiasm. But many people tell me: "Oh, well, when a man becomes an enthusiast he is a 'crank.'" I wish the good Lord would put in these townships several hundred "cranks," who are enthusiasts in their work. People say enthusiasm is one of the sentiments. What is a sentiment? I am not talking of sentimentality—the "namby pamby" thing that is the candy of life. What is sentiment? Sentiment is feeling, feeling is living, and living is making things come to pass because of our life. Just as you put sentiment in a man you put power, and this sentiment is a capital gain from the Exhibition. A man who is an enthusiast on roses goes into the garden, and he does not have quite the same satisfaction in walking up and down among those roses with a

blind man as with a seeing one; but he comes back with the consolation that the presence of a blind man has not abolished the beauty of the flowers. That is one of the sweet contents of a "crank," in that, although the blind man cannot see the roses, the roses are there in their beauty and sweetness just the same.

I want to speak on the practical part of the dairy exhibit at Chicago for a few minutes. We sent cheese and butter to Chicago for the purpose of advertising this country, its attainments and its resources. We saw two avenues open to us of getting our advertisement before the great public of the world. We thought we could give an object lesson to those who went to the Chicago Exhibition by having a display in it; and then we thought we would get the use of the columns of the press. The press is almost all-powerful to day, and because it is so powerful a man who governs a swift, strong pen should use it with a great sense of responsibility. Newspapers nowadays are the agents which mould public opinion, public opinion determines the public action and public action decides public destiny. A newspaper is a power for good, or, may be, a power for ill. But if you desire a newspaper to give you the free use of its columns you must provide something that the editor thinks worth publishing. If you make an exhibit of ordinary cheese, that is not likely to attract much attention, but if you can make it unique enough or big enough to arouse curiosity and interest you will secure the attention of the papers and their readers. The attractiveness of most exhibits is in that they are clean and lovely; and who does not know that a cheese is not 'a thing of beauty and a joy forever." Yet the big cheese which we sent to Chicago was talked of and written about until it became a vehicle advertising Canada the world around. I will tell you of a clever thing which appeared in one of the papers. I saw the editor of a Chicago paper early in the progress of the Exhibition about that big cheese, and gave him some facts about it. He did not print a line of what I told him. He did not make even a little note in the paper. Two or three days after, however, there was an illustration like this. You all remember the school-boy story of the venerable man who sat by the wayside and called the boys over to him saying, "Johnnie, turn the handle of my grindstone." By and bye the boys went by on the other side or went around the other road and did not heed the invitations of the good old man who had an axe to grind. Well this newspaper published a cut or illustration in which you could see a great disc rising. A great number of people were standing in front of it, gazing on its rising glory. A boy (looking at the mammoth cheese from Canada) says to his father, "Papa, is that the moon rising?" The answer came tersely: "No, Johnnie, that's not the moon; that's a grindstone; do you want to turn the handle?"

Now, we went to Chicago for another purpose—to gain a better reputation for ourselves, that our goods might take better in the markets of the world. It was known that we made cheese in some districts that were all fine. We wanted it to be known that we made cheese that were fine in all districts; and the object of these dairy conventions is to have all cheese fine and all butter fine. Then we expected to get a benefit to our people in stimulation from friendly rivalry. Do you wonder that a little handful of Greeks could stand close and keep a horde of Persians from running over their country? Those Greeks were trained from their youth up to contest in the schools and in public games that they might be equal to any kind of contest afterwards. When our friends brought us into friendly competition with themselves they did so that they might be fit for the keener competition in markets and elsewhere. I have heard the statement made that a long time ago the business of life was making war. Now it has come to be through the stress of keen competition that business is war—war for place, for prices, for profits, for ourselves. There was an educational value that was of no mean moment to us, calling into play the exercise of those faculties that enable us to do great things for ourselves and our fellows. In all conditions of life I find men who are laden down with information and opinions, until they go through life tired and tiresome, feeling and saying that this is but a world of sin and sorrow. They are educated men—men so laden with learning that they have no time or strength to do things. What is wanted are men educated to have their feet on learning—sound knowledge with their heads, and hands free and trained to make things come to pass because they live. If a man wants to lay a tree down let him be educated to use the axe so that he can bring it down with least waste of energy and

time. If he wants to argue a case let him be educated to perceive clearly, to reason closely, to present concisely and forcibly the points of his case, and to give them to judges and juries in most acceptable form. If one is to be a preacher let him be trained to throw the overflowing strength of his own life into the struggling lives of his hearers and make them go home resolved to be better and do better. Likewise in our dairy and agricultural work let us avail ourselves and train ourselves to use all the forces which make for real improvement and gain.

Now, we sent in June 162 cheese to Chicago and took 129 awards. We sent 43 packages of butter and took 13 awards. In June we had 31 first places for cheese, and then came in another country after that. In October we sent 533 exhibits of cheese and took 489 awards. These were scored by points, and we had 127 lots that came in before all others Less than 10 per cent. of our cheese exhibits failed. Nothing happens by chance. It was not an accident. People say "Oh, it happened so." It never "happens" so unless we use that word to hide our ignorance of causes.

There are better things than these in our agricultural work in Canada. If you will trace back through the product, through the process, through the factory to the original cause of excellence in any prize article you will find it in some man's intelligence—some man's clear thinking and skill. In October we sent altogether 167 lots of butter and carried off 27 awards. We had many difficulties to contend with, such as distance and length of time required to get our exhibits to Chicago. We also failed to do better because our experience was new. We had not before sent butter in any appreciable quantity westward for the purpose of competition. Now, in connection with this exhibition of dairy products in Chicago, we strove to do one thing—we strove to have the word CANADIAN predominant everywhere, that we might get a sort of consolidated good opinion towards ourselves as Canadians.

You will find more in which people can enthusiastically agree in this movement in favor of better farming and dairying than in any subject in which the people are eagerly interested to-day. If you speak of schools what do you do? You make a man from Ontario and one from Quebec assume hostile attitudes at once. So it is unfortunately in regard to many other matters; but when you speak of progress and attainment in connection with agriculture you can go to the Province of Quebec and say "the people of Ontario are making more comforts for their homes through dairy farming than you are, and you ought to do the same as they are doing." They begin to appreciate this, and say "that is so; we will do likewise." By such simple means—the grain of sand around which gathers a pearl of great price—you will find prejudices which have encrusted men's judgments on other matters disappearing, leaving them free to see differences of opinion with appreciative charity.

Only one or two matters more will I refer to in this connection. We need to go back all through our work on the farms and do more thinking. We want to consider our place in the community, and be more self-reliant, not relying on anything outside. It is all right to prop up a stack, but it is a poor trade which requires to be always propped up by charitable supports. Then we should be full of the aspiration and belief that we are capable of doing better things,—full of aspiration that does not merely burn to-night and die out to-morrow, but that perseveres, perseveres, perseveres, and that will finally lift us where our object is. A man says to me, "I cannot do anything of myself"; but men who say we will be as brothers for the good of Canada can do all things. A little speck of water drops from the clouds, runs down the hillside, and flows down the stream, until by-and-by it is floated across vast lakes to Niagara, that great inspiration to reverence of the majestic, the mighty. The one drop of water does its part, and Niagara has power enough to run the machinery of a continent. When we are heartily united in a strenuous desire and effort to make the most of ourselves, we will be a Niagara in power for the service of our race and the good of our land. We may now recognize that we are no longer a few people sprinkled along the banks of the St. Lawrence, but that we are the makings of a mighty nation, and in that nation it is the privilege of our boys to begin life with better prospects for enjoyment, usefulness and happiness than elsewhere.

As we recognize that our progress is not to be gained by pulling other people down, but by lifting all the people up to equal rights, liberties and privileges, and along with that if we help to give our boys the opportunities and guidance to make the most *of* themselves rather than the most *for* themselves, we in Canada will have the most generous civilization that has ever prevailed, or can prevail, until the good Lord makes the new heaven and new earth wherein dwelleth righteousness.

THIRD DAY.—MORNING SESSION.

On the Convention resuming,

Mr. Halliday presented the auditors' report as follows, which, on the motion of himself, seconded by Mr. Wark, was adopted :

AUDITORS REPORT.

We the undersigned have carefully examined the accounts of your Treasurer and find them correct carefully kept, and vouchers for every item of expenditure.

R. G. Murphy, } Auditors.
Wm. Halliday, }

Belleville, Jan. 11 1894.

(The detailed financial statement will be found in the Appendix.)

CONGRATULATIONS FROM QUEBEC.

The President at this stage of the proceedings read the following telegram which he had just received from Colonel Patton, President of the Dairy Association of the Province of Quebec :

Brome Corners, Q., 12th Jan., 1894.

To D. Derbyshire,
Belleville, Ont.

Congratulations and warm regards to the troublesome Ontario dairymen. O. G. Patton.

The President said : I am sure we receive this telegram in the very kindest spirit, and we shall respond by encouraging the dairymen of our sister province to go on progressing in the good work in which we are all engaged.

The following reply was accordingly sent to Col. Patton :

Belleville, Jan. 12, 1894.

Col. O. G. Patton,
Brome Corners, Que.

Ontario Creameries' Association send congratulations to our brethren in Quebec, not forgetting our genial friend, Col. Patton. D. Derbyshire.

PAYING FOR MILK ACCORDING TO PERCENTAGE OF BUTTER-FAT.

Mr. Frank T. Shutt, M.A., chief chemist of the Dominion Experimental Farms, was called upon to address the meeting on the above subject. He said : Yesterday we were considering the relation of science to agriculture and the benefits that arise from the application of scientific principles to the practice of farming. This morning we may briefly discuss, with much advantage to ourselves as dairymen, the adoption of a more business-like basis in our commercial transactions. Too many of us, I fear, are not "business men." Are not many of our dealings carried out on a plan (if I may so call it) something like the following ? A farmer brings a crock of butter or a bag of potatoes to the country store, and is told by the store-keeper that he can have in exchange so many pounds of sugar, of tea, or of other things. The exchange is made, but no monetary

value is assigned to the goods by either party. Such an exchange would be wanting in the fundamentals of business. Let me give you another illustration to make my meaning clear.

Suppose a man wishes to build a barn or a silo, and that he has not the facilities to do the work himself. He first ascertains the dimensions of his proposed building, and then goes to some competent builder—or builders, if there are several in his neighborhood—and asks for tenders.

Now, if the builder replied, "I don't know exactly the price of lumber that building requires, nor what I shall have to pay competent workmen, nor can I estimate the time that it will take to erect it, and therefore it will be impossible for me to give you a price, but it will be 'all right.'" I need not say that such a transaction would result disastrously in a majority of instances for the farmer. There being no distinct agreement or money value fixed between the parties, opportunities for fraud and over-charging are afforded—and, unfortunately, human nature only too often avails itself of such chances.

What then are the qualities that characterize business principles, or I may say what are these principles themselves? The most important of them are *equity* and *exactness*. There are others, but these are the principles that we wish to see adopted in the buying and selling of milk.

Let us, for a moment, consider what milk is and the basis—if such it may be termed—that we have been using in disposing of it to creameries and cheese factories.

Milk—pure, normal milk, consists of water, butter-fat, casein or curd, milk, sugar and ash in quantities that vary within certain limits. That the constituents of pure, wholesome milk are liable to fluctuation in quantity is the first *fact* that I would impress upon you to-day.

Of all the constituents of milk, fat is the most valuable—the one that has the chief commercial importance—and it is also the constituent most subject to variation whether for consumption as milk, for the cheese factory or the creamery; the percentage of butter-fat gives a true estimate of the value of the milk. These are further *facts* that I would have you bear in mind.

Now, it is very easy to suppose, nay, in view of what I have just said, it must be true, that milk varying greatly in per cent. of fat is brought to every creamery and cheese factory—and I say this without imputing dishonesty to any patron. Admitting this, it is only one step further in the argument to say that milks of varying values are constantly brought by the patrons. Our basis of sale has recognized *quantity* only so that all the patrons receiving an equal amount per 100 pounds of milk, (whether it contain three pounds or five pounds of fat), some must have been overpaid and others to a like extent under paid. There is no equity or exactness in such a transaction as that; it could not be characterized as being conducted on business principles. It seems to me that it is not much better than a lottery—though the circumstances of the ordinary lottery are reversed. There every man pays in an equal amount and draws whatever chance gives him; in one system of milk pooling, milks of varying values are put in but the same price paid for all. Quality then as well as quantity must be considered if the buying and selling of milk is to be conducted upon an equitable basis.

To do this we first of all require a cheap, ready and reliable method for estimating fat in milk. Until quite lately the determination of fat was only possible in the chemical laboratory and the analysis had to be made by an expert. That state of affairs, of course, precluded the possibility of paying in the factory or creamery according to fat contents.

In the invention or discovery of Dr. Babcock of Wisconsin—known now universally as the "Babcock Test"—however, we have a method at once easily made and reliable in its results. It is so simple in operation that it can be made in the factory or dairy as readily as in a laboratory, and the cost of each test is exceedingly trifling. Any intelligent man can master the details of the test in two hours and turn out accurate results.

About a year and a half ago we published at the Experimental Farm, Ottawa, a bulletin giving the details of a series of experiments we had made. These experiments proved beyond fear of contradiction the reliability of the Babcock test. We found by

comparing it with method of chemical analysis that by it the butter-fat in the milk could be estimated within two-tenths of one per cent. of the truth and usually the error was much less than that amount.

Again, last June, a second bulletin (No. 13) on the Babcock test was issued. In it I gave in detail instructions for making the test as well as an example of the method of calculating the amount due to each patron when paying by this system. I would earnestly recommend every diaryman to possess himself of a copy of this little bulletin; it may be the cause of obviating some trouble and will certainly prove a help. I shall not this morning enter into any account of how the test should be made nor give you ocular demonstrations of the *modus operandi*. My time I am sorry to say is extremely limited and in a very few minutes I must hurry away. But before leaving you I wish to say something respecting some experiments in composite testing we have made this year at Ottawa.

When the Babcock test was first proposed it was necessary to obtain the value of each patron's milk *daily* and this necessarily involved in a large factory a considerable expenditure of time. I think it was owing to this fact that our people did not adopt the Babcock test as quickly as we expected—for time means money. Daily testing however is now a thing of the past and the cost consequent upon the adoption of this plan is now only a fraction of what it was but a short time ago.

About a year since it was discovered that a chemical known as potassium bichromate would preserve milk perfectly fluid for a long time and that such preserved samples could at the expiration of a period of a week, two weeks or even a month or more, be accurately measured and tested by the Babcock method; and further that the percentage of fat obtained was practically identical with that obtained from the milk when it was fresh and new. Every day a small sample of each patron's milk is poured into a bottle properly designated and into which has previously been put a few grains of potassium bichromate. This substance dissolves in the milk, imparting to it a strong yellow tint. On the addition of each successive sample, the whole is gently shaken to incorporate again the risen cream. The bottle should be kept in a cool place, if possible. At the end of a week, or even longer, the usual pipette full is withdrawn and tested in the ordinary way. The result is the average percentage of fat in the patron's milk for the time represented by the composite sample.

Since the publication of this method many enquiries have reached us, more particularly regarding the amount of potassium bichromate that should be used. I accordingly instituted several series of experiments to gain information on that and kindred points, and I now propose to place before you some of the results.

EXPERIMENT I.

Date of composite samples May 8th,-15th 1893.
Mathematical average of daily tests: 3.40 per cent fat.
Composite sample A=600 c.c. milk + .3 grms. pot. bichromate.
" " B=600 c.c. " + .6 " " "

(NOTE. The quantities of pot. bichromate are equal to 1½ grains and 9 grains to the pint respectively.)

The percentage of fat was ascertained in these samples on the subjoined dates, with the following results.

Date.	*A.*	*B.*
May 15	3.4	3.4
" 20	3.4	3.4
" 22	3.4	3.4
" 27	3.4	3.4
June 3	3.4	3.4
" 10	3.4	3.4
" 17	3.4	3.4

These tests were made with the usual quantity of acid and gave clear readings throughout.

We may fairly conclude from the results ;

1. That any quantity of pot. bichromate between 4½ and 9 grains to the pint serves equally well in preserving milk in a fluid condition without interfering with the accuracy of the test.

2. That milk so treated, if kept carefully shaken and moderately cool, shows the same percentage of fat for at least one month.

Further experiments were then made increasing the amount of preservative, but for their details I would refer you to my report for 1893, now in press. The conclusion I reached after the completion of the whole work was that the exact amount (*i. e.*, within certain limits) of potassium bichromate to be added is of no moment. From 3 grains to 7 grains is ample and gives excellent results. This amount may be measured with sufficient accuracy on the point of a knife blade or in a small spoon. I would however point out the necessity of gently and thoroughly shaking the composite daily. If it is found that cream adheres in a ring to the sides of the bottle, the sample should be slightly warmed. The cream will on shaking then become well mixed again and a thoroughly representative sample can be withdrawn. If, through the use of an excess of the preservative, the readings are obscure, the quantity of acid must be slightly reduced.

These experiments were carried on with herd's milk, and after the daily test had been made the composite sample was divided and the pot. bichromate added, in varying quantities to each portion. This brief explanation will make plain, I think, the method pursued.

Now one word with regard to objections that have been raised regarding the use of pot. bichromate in the dairy. Corrosive sublimate and caustic potash have both been recommended as preservatives. The first is exceedingly poisonous, and the latter, besides being poisonous is very corrosive and disagreeable to use. Neither of them disclose their presence in a treated sample of milk by color. Potassium bichromate is not so poisonous as the above chemicals and moreover at once reveals its presence by imparting a strong yellowish red tint to the preserved milk, so that no one can mistake if for an untreated sample. It has therefore very strong claims over both the chemicals I have mentioned and may, in my opinion, be safely introduced into the factory or creamery.

I shall now conclude by giving you some reasons why we should universally adopt this priniciple of paying for milk according to butter-fat, a principle that we can now so readily and cheaply adopt by using the Babcock test in conjunction with pot. bichromate. I have shown you that it is a just and equitable basis. It will have the effect of encouraging good feeding and good breeding. It will enable a man to weed out his cows that give poor milk and guide him in breeding from his best stock. The richer the milk he brings to the factory, the more he will be paid per 100 pounds. This must lead to the keeping of good cows and feeding them liberally with nutritious food. Indirectly, the adoption of this principle will be of great value to agriculture in general, improving the soil, better and more rational methods of manuring and the cultivation of suitable crops for dairy herds. And all this will come about because the farmer will realize that he is receiving a just and equitable return for his labor and his skill in the milk he sells —the product derived through his cows from proper and skilful feeding and breeding. Let us apply as far as possible the teachings of science to our work and withal put our commercial transactions upon such an equitable basis that each may receive the just recompense of his work—be that either of the hand or head. (Applause).

The PRESIDENT : It seems to me that no man should pay for milk on any other principle than the butter-fat value for the manufacture of butter and cheese. The moment you pay for your milk on this principle you do away with the strife and contention in the country. There will be no more worry or breaking up of churches or societies. (Laughter.) The patron will take special pains to see that he brings his milk to the factory in the best possible condition, and will receive a reward according to what he has done ; and it does seem to me that it will build up our business on a proper basis.

Hon. Mr. READ: I am going to oppose that method. Being in Ottawa, the Dominion analyist asked me if I would assist in getting samples for testing. I said yes, and did so. I thought I had good cows, but the test did not show so well as I thought it should, and consequently I am going to oppose that method of paying for milk. (Laughter.).

Mr. WHITTON: Have you any experience of keeping milk for winter dairying? I have seen it frozen. What would be the effect upon it in that case? Would freezing injure the butter-fat?

Prof. SHUTT: No. Warm it up carefully and then gently shake the sample. Do not violently shake it. Give the bottle a rotary motion to stir in the cream, but do not do anything which is going to churn it, because you can not then get as good a sample for the pipette. But gently warm it, and then shake it carefully, and you will have no trouble at all.

Mr. WHITTON: How would the bichromate act upon milk which is just on the point of turning sour?

Prof. SHUTT: If we get the milk fresh and sweet, we can keep the samples by the use of bichromate perfectly fluid for at least a month. I find if a man gets it to the factory just before it has turned, or when it is almost sour, the bichromate will not bring the milk back to fluidity.

The PRESIDENT: I regret that the train leaves in a very few minutes and business at Ottawa requires that Prof. Shutt shall leave by this train. But if anyone will write him he will answer any questions cheerfully, giving full details about these matters upon any question which may be asked of him. But I will tell you what I would do in the case of a person who sent his milk sour—wheel it right home again—and it would give him a salutary lesson, and after that you will see your face shining in the can and the milk will have a good flavor. But if you allow him to send sour milk he will do it right along. If factory owners would do this in such cases they would be able to build up a business in the locality where they operate; but if they just quietly shake hands with the patrons who are sending poor milk and say, "It is all right; I hope you are doing well," etc., they will not make a success of the business. (Laughter.)

HOW TO IMPROVE THE QUALITY OF OUR CREAMERY BUTTER.

Mr. JOHN BOYD, of Chicago, was again introduced, and said: I have not prepared a paper on this subject, because I thought my paper of yesterday would cover the ground. There is no royal road to making fine butter. That we may as well set down as the starting point. Eternal vigilance is the price of good butter always, and always will be. Mr. Ayer told you yesterday about the feeding of cows, for this reason, that unless the cows are fed proper food, no care of the milk afterwards will make the best of butter out of that milk, and I believe the same thing is true of cheese. Then it is necessary to secure a supply of pure water. Next, there must be absolute cleanliness, otherwise the butter will show the impression of dirt. There must also be proper care of the milk before and after it is taken to the creamery. Last week, in *Hoard's Dairyman*, you will find an enquiry of this very sort from a man who appears to be a very careful butter-maker, and if you will permit me I will read it to you as the best way of explaining what I want to get at. It is from the *Dairyman* of January 5th:

"I am in trouble with my butter being or smelling old and musty as soon as made, and I can't possibly account for it, so come to you for aid.

"My cows are nearly all fresh, mostly ¾ Jerseys. I feed for grain, broken corn in the ear, and No. 3 whole wheat, mixed with equal quantity of threshed oats, soaked 12 hours. I feed this just before I milk, in quantity what they will eat with a good relish. The milk, as soon as drawn is carried to my dairy house, 100 feet distant from my

barns, and run through a No. 2 DeLaval separator, and the cream can set at once in a tank of cold water, warm and cold cream never mixed. I feed clover hay (slightly musty) and sometimes millet about one-half hour after milking is done. At noon my cows are let out for a drink, water fresh from a well; remain out one half hour if day is pleasant, and then put in the barn and fed sheaf oats.

"I churn twice a week, cream thoroughly mixed (which is perfectly sweet), cans set in warm water, and cream warmed to 72 degrees and set to ripen, which usually requires 18 hours, when the cream is thick and slightly acid, churned in a barrel churn. Butter of late has been coming in about ten minutes When the churn is opened it has a slightly musty smell, and the man to whom I ship my butter complains it isn't fresh, even when I ship it the next day. My dairy utensils are all washed with warm water, then thoroughly scalded with hot water, and during this cold weather are in a freezing atmosphere, and what do you think can possibly be the matter?"

Now, in my opinion, the only difficulty with that man's butter was the musty hay. I am just as positive of that as if I had investigated the whole matter. Why? Because I have observed these same phenomena right along, and, as I said yesterday, where you feed a fermented food, there is nothing which I know of that will take its flavor out of the butter. There is a distinction between feeding wholesome vegetable food and fermented food. If cows are fed musty hay, or fermented food, it will taint the milk. Fermented ensilage will do the same thing. Barley sprouts are another thing which will do it. They are a very good thing if not fed in large quantities, but once this flavor is imparted by the cow to the milk, no after manipulation, no matter how expert the operator may be, can remedy that defect. That is why I say there is no royal road to butter-making.

I will give you an instance to express this. I have a butter-maker who is also a very fine cheese-maker, getting a very high price for his butter, and the party who bought his butter was a critical judge and gave him a higher price than the market price. The butter-maker came into my place one day and said, "Mr. Boyd, there is something wrong with my butter." I said, "What is the matter?" He said, "That new-fangled notion of yours is not going to 'pan' out" I asked him, "How was that?" He said, "Up to a certain time my butter was fine, but now the purchaser has denounced it, and I know very well it is not my fault." Well, that was a puzzler I must face, because I knew he was a very excellent maker. I said, "Bring in a tub of butter to-morrow and I will see what is the matter." Next morning he brought in the butter and I went to three experts. The first man said, "Well, the butter is off flavor." "We knew that before," I said; "What we want to know is what is the trouble with the butter?" Then he went into a long dissertation about having the cream too old, but could not give us any light on the real trouble with the butter, because the circumstances were not as he thought they were. But it was "off flavor," and it was off 2 cents per lb. in its value. We went to the next man, and he repeated about the same "dose of physic." He thought he knew where the trouble was, but it was not where he said it was. The third man said, "This butter has come in contact with musty hay." I said, "How do you know it?" He said, "I can smell it. You have stored that butter somewhere near musty hay." He put the same value on the butter as the other two—it was off 2 cents per lb. They were all alike in that respect. When I got back to the office I said to my friend, "You must have been cutting up some capers with the butter." He said, "That butter never came in contact with anything to injure it." I said, "Now, you go home and investigate this matter." He did so, and, in the case of one of the patrons, found that the day before the butter first was off flavor he had changed the hay and was feeding some musty clover to the cows. I mention this to show you a reason for the faith that is in me.

The next thing is absolute cleanliness. I have gone into a great many factories where they have the name of doing excellent work, and if you ran your finger around the inside of the vat you would find that it is covered with decomposed matter. You never can make the finest butter under these circumstances, So that is another difficulty we can overcome.

The next thing is ripening the cream. That I told you about yesterday and, really, I have nothing more to say. The quicker butter is made after it comes from the

separator the better. It is true the cows may be fed perfectly and everything may be absolutely clean, yet, at the same time, if the cream is not thoroughly ripened it is impossible to obtain the best results.

Now, these things are not all equal. We have degrees. One trouble may not be as bad as another, and is not, but still they have the effect to "knock" the price off your butter, and unless they are all observed and overcome, you can never expect to get the very best butter, or a uniform butter. What we want to aim at is uniformity —not absolute perfection so much as uniformity. If you send to your commission house 50 or 60 tubs that are fine, your commission dealer will think your make is fine right along and will get a market for them. Next week if you send in a lot of butter that is off a cent per lb. in flavor he is disgusted. You want to send a uniform butter, because that is what the consumer demands, and that is what he is willing to pay his money for. He does not want good butter to-day and bad butter to morrow. If you will send a uniform butter all the time he will pay above the market price every time. I do not know any make of uniform good quality but always sells above the market price.

Mr. GRAHAM: I would like to ask whether you have had any experience of freezing butter and holding it.

Mr. BOYD: Personally I have not, but I understand it can be done very successfully if the butter is thoroughly frozen.

Mr. GRAHAM: When I was over in England the English market was getting butter from Australia, stored in cold chambers instead of being frozen, and it was sold at once on arrival. The most of our butter is sold to speculators, who hold it for higher prices. In this way it arrives stale, and then the people are under the impression that our butter is always stale. If the low price of 18 cents has to be taken for butter I think the creamery men should have it sent direct and not allow it to be stored here.

The PRESIDENT: I have found in my own trade that when I get my butter from men like Croil, Rutherford and Johnston, and get it good—just fresh from the churn —I could not possibly keep it on hand at all—everybody was bound to have it—but the minute I got butter from the factory that had been kept where the flies seemed to light on it, I could do nothing with it.

Mr. HANNAH: In regard to Mr. Graham's remarks, I think it is generally recognized by those who have had any experience in keeping butter in the way he suggests, that the colder the temperature at which the butter is kept, when you raise that temperature, the butter is going to go off flavor more than if the temperature had not been so low. Then, I believe, there is very little provision for cold storage among our factories. Eastern butter has been kept all winter and towards spring it has been off flavor. I have heard from some parties in the states, where they simply do not hold it at all, and they say the results have been very satisfactory.

Mr. CROIL: I think that the price for butter shipped at once to the Old Country this season has been better than for butter that was held; and I think it is only a matter of getting some of this fresh stuff into the hands of the people on the other side of the Atlantic, so that they may see what we have got, that is required to make our reputation. If you are going to hold the butter it does not matter whether it is for a little or a long while. It has got to get to the market fresh. If you have got to hold it you can freeze it or do what you like with it. I do not think it matters about that class of butter being stale. It seems our butter in Chicago only lacked flavor. I fancy that we are behind in this flavor business; that we do not, possibly, look carefully enough after our feed and feed it to our cattle properly. We secure a good flavor more easily by selling butter, in that case, fresh than in any other way.

Mr. BOYD: I do not want to be misunderstood. I do not believe that all the food in Canada feeds flavor. It will feed a bad flavor, but it will not feed a good flavor. Now, that is the ground I take. I thought I made that plain, but I see from your remarks I did not. A bad flavor can be fed into butter by a bad food, but the aroma you want in your butter does not come from feed. There is no scientist in the world who

has ever yet defined what flavor is. I say it does not come from the food at all. You may feed gold dollars and you cannot produce the desired flavor in the milk. The cow does that herself. She does it, not from the food, but from something in her constitution.

The PRESIDENT: With reference to this starter that has been used on the other side, I want to know if it will affect the flavor of the cream.

Mr. BOYD: My experience is that it does not—that it is the cow—the period of gestation. The reason I say that is this:—I thought I discovered the reason of the success of a number of dairymen who met in New York in 1868 at a convention of dairymen. I went to several gentlemen who had taken premiums, and I found they were all willing to talk and to tell me how they made their butter, but not any two of them made their butter alike, and I was at a loss to get any experience out of it. I found they had only one thing in common—they had all fresh cows. I went home, and the first thing I did was to divide my cows' milk, and I found that the fine flavor came from the fresh milking cows, and I have never seen anything to change my mind, but everything to confirm it. Now you will find the finest flavored butter from the fresh milkers, and that is my explanation for your failure at Chicago. You sent your butter in October when the cows were not fresh milkers.

Mr. GRAHAM: How is it you can feed bad flavor to the cows and cannot feed a good one?

Mr. BOYD: I have explained that. Take for instance, onions. You know they have a very offensive flavor. Now, it is no trick at all to eliminate the flavor of onions from the milk, or of turnips, which are another offensive thing, or of vegetable food of any kind.

Mr. MOYER: I wish you would just tell us how?

Mr. BOYD: The simplest way of doing it is to use a Cooley can and submerge the milk in ice water, or any can that has a space above the cover by which the process of aeration can go on while the can is submerged. That is not a good explanation, perhaps, but it is an absolute remedy for that trouble. The explanation that I gave yesterday is that this onion flavor is held in the milk in the form of a gas, and that is the distinction I make between the fermented food and the disagreeable food with an odor. Now, you can remove that odor by sterilizing, or you can do it to a certain extent by aerating.

Mr. GRAHAM: It seems to me from your remarks that some of our people are evidently a long way off in the setting of milk. If by that system we can drive odors out of the milk we would certainly have much better results by adopting it. If we can by submerging get rid of odors such as you speak, of this particular system ought to be adopted by our creameries, and I am glad to hear your remarks on this subject because to me they are important.

Mr. Robert READ: How would you get rid of the stable odor?

Mr. BROWER: I can hardly understand that feed has nothing to do with the aroma of the milk or cheese or butter, as it comes from the cow. In England I find they get one class of cheese from a certain section and another class from another section, and they must have a different class of cows. For instance, in Cheshire they get the cheddar cheese, which has a certain flavor that you cannot get in any other part of England. Now, is it the grass of that locality or the peculiarity of the class of cattle that accounts for this? Mr. Boyd's idea rather staggers me. I agree with him in part of what he says. At the same time I should think the feed would have more or less to do with the aroma.

The PRESIDENT: In answer to Mr. Read's question about the stable odor, we know this can be greatly reduced by cleanliness in the stable—cleaning twice a day and using plaster and a little dry muck to mix in with it. All these things will make the very best manure. At the same time you must aerate the milk as soon as drawn from the cow if you want it to be in the best possible condition. I think what Mr. Boyd has put before you in so nice a way is very important—that if proper feed is given to a proper cow we will get good results, and that improper feed will not give good results under any circumstances.

Mr. MOYER: Would not the product from one cow be as rich as from another, providing both got good food?

Mr. BOYD: No; there is an individuality in the cow.

Mr. MOYER: I have had an impression that certain cows' milk, which never had a nice flavor, could be improved by feeding. Is that the case?

The PRESIDENT: No; I do not suppose so, according to Mr. Boyd's theory.

Mr. GRAHAM: In my own experience I notice the facts are that most of the milk stands are close to the cows' stables, and in aerating milk there we get the stable flavors into it instead of out of it, and if the system Mr. Boyd suggests could be adopted it would be a convenient method of getting rid of these odors.

Mr. BOYD: I do not advocate that method in taking milk to the separator, because the cream would be separated before getting to the creamery.

The PRESIDENT: The separator takes it out?

Mr. BOYD: Yes.

A VOICE: What do you do with your separators?

Mr BOYD: We have cows coming in all the time to improve the flavor and do business all the year round. Anyone who has had experience knows that with May and June milk he can make a finer quality of butter, and do it easier, than at any other season; but if you had your cows coming in right along all the year round—one new milker coming in after another—you would exactly gauge the flavor.

Mr. WALTON: I would like to say something about this aroma. I do not think you have got this thing quite clear, to my mind. If you remember, I mentioned last year a test which took place at Toronto in 1881. I think we had fifty Jerseys, and we found that this aroma really belongs to the individual cow to a very large extent. As to the question of keeping butter, a year ago last summer we put down two packages of butter to a temperature of 18° on the 23rd of June and kept them until the 23rd of December, and when we took them out they were about the same as when put in. Last summer we tried the same experiment again, putting them into the refrigerator on 1st June and taking them out on 1st November. They were not so good, one being a little better than the other. The temperature was very much lower than on the first occasion, being down to 12°. Of course I do not favor keeping butter, because those two samples turned out right.

Hon. Mr. READ: Mr. Boyd gave me some information this morning about the preservation of corn stalks in good order and without waste, and I would ask him to give the same information to this audience.

Mr. BOYD: Mr. Read refers to the preservation of corn stalks after the corn has been husked. In our part of the country, where they have no silos, they have commenced a thing, and I do not know but a better thing, than silage. I do not want to go on record as saying it is better, but I am bothering my mind as to which is the better. Before the corn is thoroughly hardened cut it and shock up in the ordinary way, and in the fall of the year carry it into the barn and cut up by machine and husk at the same time. That cut corn is carried up into a hay mow and salted. One per cent. of salt is scattered over it right as it comes from the cutter. That corn will heat up to a high temperature for two weeks and cool down immediately afterwards and keep for years.

A VOICE: It is a silage.

Mr. BOYD: Yes, a dry silage. One man who dried his corn in this way said he lost all his crop, but he forgot to put on the salt (laughter). The salt saves it. It must be put on evenly. You can do the same thing with clover hay.

A VOICE: How high do you pile it?

Mr. BOYD: It does not make any difference.

THE SAME VOICE: You can put in 500 tons?

Mr. Boyd: Yes. You must not feed your corn to the dairy cattle whole.

Mr. John Sprague: Do I understand you to say that it is salted after it is in the mow?

Mr. Boyd: The straw carrier will deliver it into the hay barn and it is in good shape to salt as it drops from the carrier.

Mr. John Sprague: We have corn huskers in this country, but the corn is mashed and cut up as it comes out.

Mr. Boyd: That is all right.

The President: We have taken off the big ear and the rest of the ears have been allowed to remain in the silo. Mr. Boyd says it is not good economy to leave them on.

Mr. Boyd: The dry and moist silage are two different things. In putting the corn into the dry silo you salt it and make it tasty.

Mr. Buchanan: Would not one per cent. of salt induce the cattle to drink more water than would be good for them?

Mr. Boyd: No; because it is not to be supposed you feed them on this exclusively.

Mr. Graham: If this process would preserve corn in a good state I think probably it would be a good thing for our farmers in this section. The expense of building a silo is not very great, but there is a good deal of difficulty to get it built, but if we could preserve it equally well in the whole state as by cutting, it would be a great boon to our farmers.

Mr. Croil: I understand from Mr. Boyd that the flavor of the butter would be better from corn cured in this way than from the ordinary corn ensilage.

Mr. Boyd: I do not say that. I say that you avoid the contingency that you men have had in feeding ensilage. Examine half a dozen silos and you find the ensilage in no two exactly alike. One is slightly acid, some other more acid, another vinegar, and another "candy." We are talking about fine work. If you feed that kind of stuff you are bound to have it in your cheese and butter.

Mr. Brower: In many cases you can smell the silage as soon as you enter the barn, and consequently a person accustomed to this would not detect it in the milk. The difficulty here is in getting the corn in a proper state when it is put into the silo, so that when the ensilage is fed to the cows it will not produce an ill flavor in the milk.

Hon. Mr. Read: My friend does not know anything about the case to which he refers. What he says was not the cause of the ensilage being wrong. It was the want of proper cleanliness at the time.

The President: If the corn is at the proper stage of maturity and is put into the silo properly you are going to have fine ensilage, but if you cut the corn when green—when there is 90 per cent. water in it—it becomes black and is an injury to everything that comes near to it.

The Convention adjourned.

THIRD DAY—AFTERNOON SESSION.

On resuming at 2 p m. Mr. J. S. Pearce, of London, read the report of the Nominating Committee, which, on motion of himself, seconded by Mr. Halliday, was adopted.

(The list of officers appears on page 156.)

CANADA'S BUTTER AT THE WORLD'S FAIR.

Mr. J. S. PEARCE, of London, then read the following paper: When your President asked me to prepare a short paper for this Convention, I thought I could not choose a better subject nor one that would be of more interest to the members of this Association. You are all no doubt aware that Canada did not make either a very large exhibit of butter at the World's Fair nor yet a very creditable one. While we came off with flying colors in nearly every other department of this great exhibition, Canadian butter was "not in it" but we hope to "get there" later on, and I have no doubt that we shall; and should a similar exhibition be held five or ten years hence, I have no hesitation in saying that we will by that time make as fine butter as any country on the face of the globe.

There is no reason in the world why we cannot make as good, if not better butter than our neighbors across the lines. That we are not now doing this, was plain to anyone who saw and compared the American butters with those from Canada. While all the other exhibits from Canada have been extolled both by the press and our public speakers, not a word has been said about the exhibit of Canadian butter.

Now I think that we should one and all look the facts in the face and find out the trouble, get at the remedies and apply them not only in our own individual cases but endeavor to advise, instruct and induce one and all to apply these remedies, and not rest until Canadian butter stands as high as our cheese now does. That this can be done, I have not a shadow of a doubt.

Having had the honor of being appointed one of the judges on butter at this great exhibition in June, I there had an admirable opportunity of seeing and comparing our butters with those made in the leading dairy states of the United States, viz.: Illinois, Wisconsin, Minnesota, Iowa, New York, Nebraska, Vermont, New Hampshire and other States.

The score card for judging butter at Chicago was as follows: Flavor, 45 points; grain, 25 points; color, 15 points; salting, 10 points; packing, 5 points—total 100.

All the butters scoring 97 and over in the June exhibit were awarded medals. There were some 800 exhibits of butter in June and 43 of these came from Canada. Some 275 of these 800 exhibits of butter scored for medals and Canada got 14 of these. In October, Canada had 170 exhibits of butter and took 27 medals. The minimum points for an award in October was 95 for separator cream, 94 for gathered cream and 93 for dairy. The score card is an admirable method of judging both butter and cheese and where a record is made of each exhibit and its score anyone who chooses to take the trouble can look up and find wherein his goods were defective and on what points to apply the remedy.

There are no good reasons why there should have been such a marked difference between these two products from Canada, (that is cheese and butter), both belonging to the same industry; but to my mind, the reason is not far to seek, and it is this: The prominence given to the best methods and improvements in cheese-making through our conventions, instructors, inspectors, and that for the past twenty years; to these is largely due our present position. Butter-making has not been as profitable as cheese and has led to butter being neglected somewhat. There is now, however, to be noted a steady increase in the attention given to the production of fine butter during the past two years in Canada, and this increased attention and improvement is largely due to the attention that has been called to this line of work through the efforts of Prof. Robertson, Dairy Commissioner, and the travelling dairy. The latter has done an immense amount of good work by showing the people some of the simple rudiments of butter-making and by awakening an interest in this work and also by giving the people an object lesson in using taste and neatness in putting up their butter in an attractive form for their own local market. By Prof. Robertson in advocating winter dairying and doing all in his power to stimulate and induce the dairymen to go into that line of dairying. In this line of work we want the hearty assurance and co-operation of Prof. Robertson as Dairy Commissioner and the Hon. John Dryden, as Ontario Minister of Agriculture. This improvement can only be accomplished by co-operation on the part of all, and by the individual dairyman following out carefully the instructions given.

I remarked at the outset of my paper that Canada did not make a very large exhibit. Why was this? Were our makers aware that their butter was not up to the mark or was it through indifference and want of urging? Be the cause what it may, those who did exhibit deserve to be commended and congratulated for so doing, for had our makers all kept their butter at home we would have been left entirely in the dark as to how our butter would have compared with the American.

Canada's exhibit was not a creditable one. Why was this? I shall answer this by now taking up some of the points or qualities in which the Canadian exhibit was defective and why. I will take up these points in the order in which they are found on the score card. The first is flavor and to this quality is given 45 points. In much of the October exhibit and to some extent in the June exhibits, was the flavor defective and much of the butter had a fishy taste and odor. The New York exhibit of June butter, especially the dairy, had this same odor and smell, and the opinion of those in charge was that this flavor was due to the use of poor and impure salt, and possibly in some cases, unclean salt through exposure and in many other instances to uncleanliness. I saw myself in a creamery I visited this summer the milk vessels including all the tinware washed in a liquid that resembled milk in color which was contained in a wooden tank which milky liquid looked to me as though it had been used for a week for the same purpose. The tinware in this case was simply rinsed through this fluid and then hung up against the wall to dry with great drops of the same liquid standing out all over the tins, this was allowed to dry on the vessels and I do not think they were ever scalded. Now, we can all imagine the flavor of butter made in such vessels. It may not develop anything very serious for a week or two but how long can such butter be expected to keep its fine flavor if ever it had any. Now, that these flavors in milk, butter and cheese become better known and understood and when scientific men tell us that many of the flavors found in milk, cheese and butter are conveyed to these articles through germs or bacteria floating in the air and falling into the milk and thus develop and multiply and so in that way impart these flavors. When scientific men tell us this, and I for one believe that they are right, it behooves everyone who has anything to do in the handling of milk to be doubly careful about exposing the milk or its products in any way to these odors or germs. As these points are being better understood by the makers and instructors it should be their duty to see to it and impress these facts on all who have anything to do in the handling and manipulating of milk; in fact, it might be well for our butter and cheese-makers to do some experimenting along this line and give their patrons an object lesson on the danger of contamination from exposure to odors. Now, that the danger from exposure to bad odors is being better understood makers should be very careful and not allow their butter to stand exposed to the atmosphere. Do not allow the butter to stand round after churning, get it into the tubs and get the tubs covered up and put away in a cool place.

I also think that greater and more care should be used in lining the tubs and top with some air tight article such as parchment paper instead of cloth, as is now generally done. Many packages of butter sent to Chicago had been covered with a dry cloth or muslin and when this was lifted there remained the marks of the cloth in starch on the butter. This is a grave defect and one that no one in his senses should do or allow to be done—even the pure parchment paper should be wet before being laid on the butter.

The next quality is grain, and to this was allotted 25 points. This depends entirely on the butter-maker's skill and judgement and in 9 cases out of 10, there is no excuse for imperfect grain. The Canadian exhibits of butter on the whole rated well in body or grain.

Color comes next and has 15 points. This also is in the hands of the maker and he alone is responsible for any imperfections, but I regret to say that the June exhibit of butter was defective in this quality, much of the butter being mottled. The cause of this must be well known to any butter-maker and is something that should be well understood, for it is a very bad feature to find in a fine or fancy butter, and yet there was any number of packages of fine butter shown at Chicago almost perfect except in this respect.

Salting is next and has 10 points. Now, there was a great variation in the salting, probably as much as in any one other quality on the score card. Much of the Canadian butter was salted too high, but this is a point that has to be governed to some extent by the market for which it is intended. There is one thing that has struck me very forcibly with regard to salt and that is, there is not the proper attention paid to procuring the best salt, and when procured there is not the care taken of it that there should be. I have come to the conclusion that the only safe and proper way for dairy salt to be handled and cared for is in barrels. I have often noticed a sack of salt, perhaps dairy salt, leaning up against a barrel of coal oil or what is worse lying under a bail of cod fish in freight sheds and on station platforms. I have seen many lots of cheese and butter salts put into dirty, filthy cars so bad that a portion of the salt in these sacks was unfit for use in a cheese factory—actually discolored with filth. Then again how often do we find the salt at the factory and the farm house put in the vicinity of some unsavory article or surrounded by some odor and allowed to stand there for weeks and months and yet these people wonder what is the matter with the flavor of their butter. What is to prevent this salt in sacks taking up all these germs and odors and then imparting them to the butter. My firm conviction is that much of the trouble in the bad flavor of butter might be traced to impure salt, either impure when made or made impure by exposure to bad odors by standing in sacks in exposed places.

We now come to the last, but not the least, of the qualities on the score card, viz., packing. This had 5 points. There were few packages of Canadian butter that scored perfect on these 5 points. The most serious defects were in filling the tubs and in putting on the cloths. Nearly all the American packages were well filled, some within a quarter of an inch of the top and others full to the top. This adds very much to the appearance of the package when opened up. The method of putting on the cloth or paper on top of the butter also adds much to its appearance and there is no reason why every butter maker should not understand this and be able to put up and finish a uniform package, so that each and everyone would score five points. I hope our butter-makers will go into this matter and discuss it well and thoroughly among themselves, and resolve that they cannot and will not feel satisfied until they can make butter that will score as high as any other country on the face of the globe.

A word to both cheese and butter-makers before I take my seat. This is an age of rapid progress and improvement, and there are some very rapid strides being made in advance all along the line of dairy work. Are you all awake and alive to the importance of your being well up and in touch with all these improvements? Are you keeping yourselves well read up on all these improvements and advances in dairy methods? You may rest assured that he who is not so doing will some day wake up to find that some other fellow has got the start of him and he will be left behind in the race. You may say how is this to be obtained, and how am I to keep up in all these matters? By plenty of reading on these subjects, both by taking some of the best dairy and agricultural papers and other works, by attending all such conventions as this and other meetings for discussion on dairy and agricultural subjects, by taking part in these discussions, by sitting in the midst of the professors and doctors, both hearing and asking them questions, by visiting the Experimental Farms at Ottawa and Guelph, and last but not least by taking the short course on dairying at the Ontario Agricultural College, Guelph.

Mr. MOYER: Did I understand you to say the highest points were 94?

Mr. PEARCE: No, sir.

Mr. MOYER: Because I see the highest was by Brill, 97.

Mr. PEARCE: That was in June.

Mr. MOYER: One scored 97 and, I think, one 99.

Mr. PEARCE: The separator butter was fixed as stated in the paper. All that scored over 93 scored for medals. Anything under that, of course, got no award.

A VOICE: What is the best way to finish a tub of butter?

Mr. PEARCE: The package that I thought the neatest was full to within a quarter of an inch from the top. This was done by taking a straight edge, which was cut at either end, so that it would fit inside the package and extend a quarter of an inch below the top of the package. By turning this around it gave a nice true line to the top of the butter and an appearance as if the top had been turned in a lathe.

Mr. MOYER: We should then have one package containing a greater weight of butter than another. Would that not prove inconvenient?

Mr. PEARCE: I think the difficulty Mr. Moyer speaks of is only imaginary.

A VOICE: What do you do with the butter you scrape off?

Mr. PEARCE: You do not scrape any off.

The PRESIDENT: The point Mr. Pearce is making is that the appearance is the all-important thing. The next thing is that this quarter inch is filled with parchment paper and then covered with paste so that there is no dead air to get the butter off flavor. Whether the package weighs 49 or 71 lb. does not matter so much. I would have it full anyway.

Mr. MOYER: I like having the packages all the same weight.

Mr. HANNAH: One tub will hold more than another and buyers like to have a uniform quantity. For the Old Country market we do not find that they care so very much. We try to keep on the safe side by not having it too full. We always try to put a paste on top where it has to be handled much and shipped a long way. Your butter will likely loosen and all break up and look mussy if you fill it up. These are a few of the points we find in practical experience. I find it is very difficult in all cases to get the same amount of butter in the same tubs. The butter is sometimes a little more open than at others, and it will take more room then to make a certain weight.

Mr. BRUBACHER: We have no special way of finishing off the tops of the tubs, but try to fill them as nearly as we can. Of course if we could get a way whereby we could smooth the top off better than by the ladle it would be very desirable, but we have not found it yet. I do not think it would be possible to do this in the way Mr. Pearce talks about after the butter is solid.

The PRESIDENT: I was considerably interested in reports of the creamery at Massena, N. Y., and paid a visit to that factory. We found they had a central factory, with skimming stations in different directions. These skimming stations received the milk just the same as at the central station. The milk was skimmed at these, and the results entered in the books, and then it was taken to the central station and churned. We found that every man had his particular business. The man who packed the butter had nothing else to do. The boxes were made of spruce and seemed to be of an exact size. I saw the packer levelling off the top of the butter with a straight edge, and the top of any one of these tubs looked as if it had been turned in a turning lathe. They ship a carload a week to Boston. That is the largest creamery I ever had the pleasure of visiting. It struck me, too, when Mr. Pearce brought out this point, that Smith and Evans serve every tub exactly alike.

Mr. RUTHERFORD: I find it very difficult to get tubs that will hold the same quantity of butter. The American tubs are a great deal better made than ours. I have never adopted the method of smoothing my tubs, which Mr. Pearce mentions. We have just done it with the ladle. I have seen it done in the American creameries, but I do not think we could make a success of it here.

Mr. MOYER: I used to first spread a thin cloth over the butter, and then use the ladle over the cloth. This did not leave the top with a greasy appearance.

Mr. WHITTON: At the Experimental Station at Wellman's Corners they use a ladle, and by turning that around with a slight pressure get a perfectly smooth surface. It looks as you say, Mr. President, as if it had gone through a turning lathe. They have the tubs made to hold 56 pounds, and I have never seen any trouble about getting the same weight.

Mr. BRUBACHER: Do they put the same quantity in all the tubs at the factory the President spoke about?

The PRESIDENT: If the tubs hold 55 pounds I would put it in; but I believe I would have the tubs as uniform as possible, and where they are the same size I do not see how there could be any great variation in weight.

Mr. PEARCE: When I said a quarter of an inch I meant approximately, and there is not the slightest occasion for scraping any butter off the top. The Americans had an even weight and there is no reason why we should not have it. If there is not uniformity in the size of the boxes ship them back. Make the box-makers give you a uniform size. They will do it. All it wants is a little backbone on the part of the factory owners.

Mr. CROIL: There is no doubt a great deal of trouble in getting this weight right. I think the trouble is principally with the butter-makers. They are not particular to bring the butter to a proper temperature for packing. The trouble often comes from the butter having got too cold when it is packed. With an even temperature the maker would be able to put the same quantity in each tub. We tried smoothing off the tub, and found it hard to get the right weight. There is another very important matter. That is the lining of these spruce tubs with parchment paper and using a pickle. The butter should be kept pickled all the time. There is more fancy butter goes off flavor from the tubs than in any other way. Their covers are often made of very poor wood. If you fill the tubs, with that raw wood, you may depend upon it the butter will go off-flavor. Do not put your cover on until you get the salt on and then a layer of paper on top of the salt. Some people think the covers should be cured.

Mr. WARK: I agree with Mr. Croil in every particular. We use 70-lb. tubs now altogether, and, as he says, it is pretty much owing to the temperature at which the butter is packed as to whether there will be the same quantity in each tub. I am very particular in the beginning of the packing. Pack the first quantity you put into the bottom thoroughly, and the same with the next, and so on, and then there is not so much difficulty. I put in 70¾ lb. into the 70-lb. package, and then pack it thoroughly. Then I use a straight edge such as Mr. Pearce speaks of, but only half the length of the tub, and in this way any one can smooth off the top very nicely after getting accustomed to the work. I never have any trouble in getting the right weight.

Mr. CROIL: You might just as well give the buyers a pound on the start. Make up your mind they will beat you out of that much anyway. (Laughter) My tubs hold 25 and 70 lb, and the butter is weighed very carefully. Use the scale when weighing your butter. It is nicer to be certain of what you are doing, and have your cheque come back without any trouble.

Mr. BROWER: From what I have seen I may say that a great percentage of butter sold in the Old Country is put into 112-lb. packages, and they say they like these the best. They want it shipped immediately, and the quicker it is sold the better price they can get. Buyers tell me that after it is held a week it will deteriorate 10 shillings per hundred weight. I think if I were packing butter for exportation I would be inclined to use these firkins.

Mr. CROIL: We have not got that grade of butter for exportation. Some people will tell you two-year old butter is better than one-year old, and they will pack in any style of firkin. So far as Canadian butter is concerned it has been packed for a cheaper trade. It has been held over from June or July and shipped in the fall of the year. You might call it salt butter as compared with fresh butter—the same as you compare fresh with salt meat. We are getting a better price packed in the smaller tubs, and I would not advise putting butter in those large firkins unless you know what you are going to do with it. Nobody wants it in Canada at all.

Mr. ZINKANN: We find the large firkins suit our trade best. We sent some 140 lb., and a few 70-lb. firkins to the Old Country, but the 140-lb. ones did the best.

Mr. CROIL: Where was the butter sold?

Mr. ZINKANN: It was packed in Chesley and Ayton and sold to Carter in Wales in July.

Mr. GRAHAM: I shipped some butter in 112-lb. oak firkins with galvanized iron hoops and some in tubs, and those in the firkins brought five shillings more than those in the tubs.

Mr. BROWER: You may have confidence that old England is going to consume your butter and the sooner you get into it the better.

Hon. Mr. READ: What they want is firkins. I have been there time and again in the past twenty years and always see the same thing.

Mr. MOYER: I have had some experience in this matter. I had the idea that the larger the package the better would it carry over there. Consequently I got a few barrels about the size of coal oil barrels and filled them. There was a hole in the top of the barrel about six inches around, and when the barrel was about full I filled it up with brine and then screwed the lid over this little hole. I sent that over with some other butter. The person to whom I shipped wrote back "what are we going to do with it?" I replied "is it not all right?" "Yes," they said, "but how can we handle it?" At last they sold it for half price; I do not know what it was used for—perhaps soap grease.

WINTER DAIRYING.

Mr. WHITTON was called upon to address the Convention and said: I imagine our worthy chairman thinks every person should be prepared at a moment's notice to say anything and everything. However, in regard to this winter dairying, I am an enthusiast, and I must congratulate you on the grand success of your Convention in Belleville. I see the butter-makers are so enthusiastic that we cheese-makers will have to move forward or we will be left behind. Winter dairying was sprung upon us in this section in the spring of 1892, when a dairy station was established at Wellman's Corners. Our butter last year was a grand success.

A cow, in my opinion, is simply a milking machine. You have got to take care of her. You have to teach her to be pleased when she sees you come into the stable. You must keep her comfortable and warm. My theory is that as soon as I have to put on an extra coat to keep myself comfortable in the evening, that very night I want my cows in the stable. You farmers know that if there comes a frosty night and your cows are out doors you will notice a difference in the milk pail next morning.

The cows want to be kept warm and to have plenty of succulent food. This year we pastured four acres of land until I had the hay off. I used ensilage up to the 10th of June. By that time I had clover hay to feed the cows and afterwards green peas and oats. The consequence was that up to the 1st day of August they made $275, although all the feed used was four acres of clover and one acre of peas and oats. I claim that pasturing is too expensive.

A VOICE: How much did they make throughout the year?

Mr. WHITTON: That is just the result of this experiment. I just pastured four acres of clover and one acre of peas and oats.

Mr. GRAHAM: For what time?

Mr. WHITTON: From 1st April to 1st August. What I want to come at is the care of the cow. What we want to do is study the cow. Give her plenty of succulent food. This last season I have had a very mixed lot of cows, and between the cheese factory and creamery I have sent over 6,000 lb of milk this season already per cow. Now, I claim it is the extra care that the cow gets which accounts for this; and we want to go on with winter dairying. I received last year from Prof. Robertson a cheque for my share, of $193 for eight cows, besides their skimmed milk, which I claim netted me $75. I had eight pigs in the pens. Say they were gaining about one pound a day, as pork sold for $6 per cwt. last winter. My cows last winter

just cost me eight and a half cents per day to feed. Consequently I had a pound of butter for two and a half cents. Now, if one of you can make cheese cheaper than that I would like to hear it. I can give you a rough idea of what we took from these eight cows in 1892: Cash from cheese factory $505; by products $80—that is the sale of calves and the profit and whey; cash from creamery $193; by products $75—in all $855, cost of feeding these cows $294. That leaves a net profit of $70 75 per cow.

Hon. Mr. READ: The popular idea is that you can milk out a cow in three or four years. It is not the case. Since the establishment of joint stock companies in this country I have been working my cows for all they are worth. I have had cows 19 years old that kept right up. I spent the winter of 1871 in the Old Country trying to work up this butter business, but the butter then did not suit. There is an idea that winter dairying is going to damage our cheese. I am an enthusiast as to making cheese, and am satisfied that our climate will admit of it and our circumstances will demand it.

THE SCIENCE OF AGRICULTURE.

Prof. C. C. JAMES, was again called upon and said: I do not know that you could adopt any better plan for a successful meeting than simply to continue work as you have been at it for the last hour. It seems to me that for the last ten or fifteen minutes you have been getting down to a business basis. Frequently the line is drawn too rigidly between speakers and audience, and those on the platform have a monopoly of the talk. That should not be. The trouble in that case is that the speakers are not quite sure whether they are striking oil or not—whether they are giving just that which the Convention is most in need of—and it has a very depressing effect frequently; but if the members of the Convention can only be interested to such an extent that they will rise here and there and ask questions and give their experience, we must necessarily get down to the points which are of most interest to the Convention, and perhaps of most interest to the locality. Because of that I am in favor of limiting the speeches and spreading the discussions to the members of the Convention. And it is well to have a variety. If we talked of nothing but butter, and confined ourselves simply to one line, we would all become tired. Your President has evidently wished to give as great a variety as possible to the programme, and he has alloted to me the subject of the Science of Agriculture.

Supposing you have a field to be drained, and you come down to the city and hire a man who is loafing about the streets to work for you at $1 50 per day. That man finds a spade and shovel and goes to work. He asks no questions, but simply is told to dig a ditch from one point to another, and he does it. He does not know what is the reason for digging it. He does not know the benefits from digging it. That man takes very little interest in the work. His interest centres in the $1 or $1.50 a day he is going to earn, and the probability is that it is a great deal more than the worth of the work he has done. But supposing the farmer goes to his son and says, "That field needs draining; we notice that it is late in the spring; when it dries up it is all in cakes; we want to drain it in order to bring it into a good state of fertility!" So they go on and talk over that work, and come to a conclusion as to the best way to run the drain and as to running it a certain depth in order to get a good outfall. That young man on taking hold of the work understands what it all means. He begins to take more interest in the work and sees ahead not merely to the doing of a day's work, but the effect afterwards on the state of the crops and on the dairy products Why does he take hold with a new interest? He does not simply know the *how*, but he knows the *why*. Now, that will illustrate two classes of men in the towns, cities and country. Here are two men—one is willing to go ahead, plodding, because he does only what he is told to do; the other man wants to understand the nature of his business from top to bottom He is to be called a scientific worker. He requires to have an exact knowledge with reference to his business. He understands the reasons for doing things. All that knowledge we put together and call it science.

I think you will admit, with me, at the outset, that in the dairy business it is advisable that we should understand as much aspossible of the "whys" and "wherefores," as well as of the "hows" of dairying. The man who understands the "why" of business, as well as the "how," will make a far better man than one who simply understands only either the "why" or the "how." There are various ways of getting this information. That which is most common of all, perhaps, is that which men acquire for themselves by their own experience. But they have not time to gain all information from their own experience. Frequently, from reading gricultural text books, we can get a deeper insight into this business.

It was my privilege for a number of years to study more particularly food products and the nature of the soil. Here is a pound of butter. What is that butter? You say, "Oh, that is the fat obtained from the milk," and everything else in it is but of little value. That man's answer means that we must have oil, water and casein. There may be a little of the sugar and the ash, but it is in the main the fat or the oil that is valuable. Now, did you ever ask yourselves the question as to wherein the fat of milk differs from other fats or oils. Wherein, for instance, does it differ from beef fats? It is of a different odor and taste. It is of a different composition or mixture. We know that the fat we get from the food of animals in winter is quite different from that which we get from them when on pasture or soiling crops. Feeding to a certain extent determines the keeping quality, the flavor, the general quality of butter. Where does this quality come from? It does not come altogether from the cow, but it comes partly from the food. Now, a question every farmer can determine for himself is the effect of the different foods on the quality of the butter found in the milk. There is in this a very important line of investigation which will some day have to be worked more thoroughly than it has been, because on it depends to a great extent the character and keeping quality of our butter. Are we feeding anythingtoo oily to our animals? Are we feeding anything that has an obnoxious flavor? If so we ought to be able to remove that and feed something that will not give an objectiona ble flavor. I have said that butter should not contain any fat except what was originally in the milk. About six weeks ago a young man came into my office in Toronto and asked me if I was familiar with the new patent process for making butter which was being put upon the market. I said I was pretty familiar with it I had taken pains to make myself familiar with it. "Well," he says, "they contend that by this process they are able to make two or three times the usual quantity of butter." Now, that young man came from a good dairy family and had a good ordinary education, and I looked in utter astonishment at him. I asked him to sit down, and said, "Do you think it is stuff is such that your folks at home could use it?" "Well," he said, "I don't suppose that it looks exactly like butter." If that young man had taken his knowledge fo the composition of butter and applied it in this matter, just as I figured it out with him, he would have seen that the idea was an utter absurdity. Yet there are people all over the country reaching out for that and other frauds. Why are they frauds? Simply and solely because butter is butter-fat, and you cannot make butter-fat out of anything but butter-fat, and if it is not in the milk you cannot get it out.

The next question which comes before us is, "Where does that butter-fat in the milk come from?" There are a great many who seem to have the idea that the cow manufactures it within herself, out of herself, or, perhaps, out of the air that she breathes or the water that she drinks. Now, let us carry this back a little. Where does it come from? It cannot come from any other source possibly than from the food which is given to the cow herself. If the food is not given to the cow you cannot expect the cow to work a miracle. Do we examine that cow with as much care, do we apply to it the same scientific reasoning, that the manufacturer does to the machine that he puts in his shop or mill? Does he leave that machine very long without finding out what it can do? How long would you expect a manufacturer to keep a piece of machinery in his factory without knowing its capacity? The cow animal is a machine just as much for the work of the dairyman as is the machine which the manufacturer puts in his factory, and the intelligent dairyman makes himself absolutely certain as to the capacity of that machine. If he purchases a machine that does not come up to his expectations, what does he do? He sends off to some other manufacturer, and perhaps sends back the

machine which has failed to the man who sent it to him. He says: "I want a machine which shall fulfil a certain requirement" and no man can afford to keep a machine in these days that will not do so much work. Take, as an example, the statement of Mr. Whitton here to day. He says, I think, his cows supplied nearly 6,000 lb. of milk each in the season. He had ten cows. Supposing five of these were producing 6,000 lb. and five only 3,000 lb. and you would have 45,000 lb. altogether as against 60,000 lb. which Mr. Whitton obtained. Most men would say the former figure is about the average yield of the cows of this country. Supposing a farmer finds out that five of his cows are yielding 6,000 lb. and the other five only 3,000 lb. would he not then be a very foolish man if he did not throw out the five machines that were living upon his other five instead of trusting to good luck on the production of 4,500 lb. of milk? We say how are we going to do this? Cannot the farmer determine the working capacity of his machines just as well as the manufacturer can? Over in the State of Wisconsin there is a man such as we sometimes call a mere theorist or scientist who had worked away patiently and scientifically until two or three years ago he put on the market gratuitously, without even patenting it, a machine for testing the value of milk simply and accurately, and I think when the day comes for it the dairymen ought to erect a monument of some kind to the memory of Dr. Babcock. He is a man who could have made a fortune for himself by his invention; and yet because he was in the public service, when he had got his invention finished, he was so honest that he put out that little machine and never got anything for it. That reminds me of the old story that is told of Benjamin Franklin. You will remember that in his early days he got the idea into his head that there must be electricity in the clouds. When he told his friends they laughed at him. He went on experimenting regardless of their ridicule, and put up his kite until on a cloudy day it went right into the clouds. His friends were there watching, but at first nothing appeared. He told them to wait a few minutes. Rain drops fell and wet the cord, and at length down the tiny cord there came a thrill of electricity. He proved his theory. They said, "Of what use is this?" He replied, "Of what use is a baby? That baby will grow to be a man. This little experiment of mine is now a baby; it will grow to be a man." So it did, and we see it to-day in the electric light, and electric cars and electric motors, and it is growing and growing, and when you come across these theorists remember the efforts of Benjamin Franklin, and that there may arise greater discoveries in connection with dairying than even the discovery of the Babcock test. By means of this test a man may take his cows and find whether any particular animal is behind the point where it ought to be in order to pay. The cow is a living machine, and just in that respect is very much superior to that dead piece of machinery which the manufacturer has.

Here is another point I want to make—that the farmer requires more skill, more nicety and more careful observation than the man who may be simply handling a piece of dead machinery that has been constructed for him. Now, that cow, that living machine, needs to be kept in constant repair, for the tissues and muscles are being constantly destroyed, and unless we supply the material for new tissue we cannot expect to keep the animal in first-class condition. Let us apply that to the feeding of an animal. The animal first requires that this wear or waste be replaced. She demands that she shall be kept warm. The animal that produces 3,000 lb. of milk in a season demands just about as much food to supply this waste as the animal that produces 6,000 lb. The outlay in the two cases is just the same, but in one case the animal produces only 3,000 lb. and in the other case 6,000 lb.; so you see that by keeping 5 cows producing only 3,000 lb. and 5 producing 6,000 lb. we have a loss which brings home the exceeding great importance of the Babcock test.

Some experiments were made at the Indiana Experimental Station this year to ascertain how much it cost to keep an animal outdoors. I think it was Mr. Pattullo who made the statement that bad roads are more expensive than good roads. It always costs a great deal to be ignorant. It costs a man more to be ignorant than to get an education. It costs more to keep a cow outdoors than inside. By this experiment it was found that the cost was $13 per head more to keep three animals outdoors than indoors. Why? Simply because the demands of the animals for sustenance are so much greater outdoors than indoors. In the case of a steam engine heat has to be kept

up to generate steam. If we set this machinery out in the face of the cold gales and blizzards of winter, will it not take more fuel to bring up the heat than if the machinery were placed in shelter. We have only to apply that principle to the work of our own animals, and I think we can solve the question for ourselves. The cow, then, is simply a machine, and takes the food and produces the milk out of it.

I just want to say a word or two about the butter-fat. Some people have the idea that a cow can make butter-fat out of anything; that if she is a machine she can convert even bulky foods into butter-fat. Butter-fat is a compound of a very intricate nature and one that it is extremely difficult to produce. No manufacturer expects a machine in his shop to take a rough pine plank and out of it produce a fine walnut board. Yet sometimes we expect this living piece of machinery to take straw and from it produce butter-fat. The fat is the most difficult to produce of all the constituents of milk, and careful experiments have shown that it can only be produced from that which we call the nitrogenous constituents of food. There is very little of the nitrogenous compound in straw, but we find well-matured clover, peas and corn rich in these constituents. Therein lies the secret of food for the production of butter. Why? Simply because such food contains these nitrogenous constituents in large quantities, and it is only out of those that the cow can produce the butter. So that a man who feeds without reference to that will have to get the cow to work a miracle for him if he succeeds. We must have, in the first place, good, rich nitrogenous food, such as corn, clover, peas and oats, out of which the cow can produce butter. Then, if she is a proper working machine, she will be able to produce a good, liberal supply of butter-fat.

Now, where does this nitrogen come from? You see we are going back step by step. Some think the whole production of butter is in the creamery; that the men who make the butter are the all-important factors; but the man who feeds the animals is also an important factor. We have now got back to the food. Where does the plant get its nourishment? From the air, the rain and the soil. The plant is composed of the roots, the stalk and the leaves. The roots draw nourishments out of the soil, and the leaves go into the air and drink in nitrogen and carbonic acid. But there is another point—the plant cannot do this except in the sunlight. The plant takes up an enormous amount of food from the air, but can only do it in the green leaf when the sunlight is upon it. Supposing we sow corn broadcast, the air cannot circulate freely among the stalks, and the sunlight cannot get in among them. That is wherein we are not allowing the elements of nature, which are free to us, a fair chance to work in order to help us. Here we have three great constituents which are important factors in dairying—the air, the rain and the sunshine—and we must carefully keep their importance before us if we want to get from them all the kindly help that they can give. If, instead of planting out our corn broadcast and keeping it confined in that way, we put it in hills or drills, so that the air can circulate and the sunshine get down about it, we will take off tons of food that in reality have been drawn from the atmosphere and worked into food for us simply by the air and sunshine being given a fair chance.

Now, there is another way in which the atmosphere can be utilized to our advantage. Take one place and you will find that clover is doing well, while in another the crop is poor and sickly. Pull up a specimen of each crop and take it off and examine it and see for yourselves what the difference is. You will be able by this means to get an insight into a point which is becoming of far more importance than at first was thought would be the case by those theorists who made the discovery. You will find on those plants little knots or nodules all over the roots of the healthy plants, but none on the others. These scientists, especially in Germany, began to investigate the reason for these nodules, and found that they were full of little things like yeast which fed the plant. They are able to act upon the nitrogen of the air and take it up, and consequently clover is an exceedingly nitrogenous plant, although it takes very little of that material from the soil. There are a lot of other plants that are similar to clover, such as peas and beans, which are sometimes called the luguminous plants. If you go into some sections you will find men who have taken hold of these crops and advocated them until they are called "cranks."

What has been the result? They have been producing rich butter-making crops, and have been making their butter out of the atmosphere. The consequence is that they have been building up their bank account at the expense of the atmosphere.

Another way in which we can get the atmosphere to help us in building up our crops is by under-drainage. All of our soil has come from the original rocks. What has produced it principally? The action of the atmosphere. If that is so, can we not correctly conclude that it will go on in the way it has been doing for the past centuries? Well, you say, that cannot amount to very much. Our plants take less than 5 per cent. of their nutriment from the soil. We have here the air all the time, and as a usual thing plenty of rain and sunlight. How is it, then, that it becomes of such great difficulty to produce plants if they take such a small portion of their nourishment out of the soil? Because there is such a small quantity of the nourishment they require found in a soluble form in the soil. By thoroughly opening our soil we let in the air, and continue the process of soil formation. Then we let in the rain. What advantage is that to us as farmers? Take a sample of well water and compare it with rain water. What is the difference? As the rain comes down it washes carbonic acid and ammonia and dust with it out of the atmosphere and carries it into the soil. That food which is washed down by the rain is exceedingly important. If we drain out the space below the plants the $3\frac{1}{2}$ feet or so of sub-soil becomes nothing but a filter, and if you test this water as it comes out below you will find that it is loaded with lime and is hard water, and has given out a very important part of its constituents to the soil. We drain not only to let out the water from the soil, but to let in the air, and the rain and the dew. So that by draining we are constantly drawing in the water, and the sunshine and the air.

Now, I have said that the fat of the butter comes from the fat of the milk. The cow cannot produce that herself, but it must be in the food in the first place, and is taken almost entirely from the richest part of the food, and those foods in which it is found most are well matured corn and clover, peas, beans, oats and the by products of the wheat.

Now, what have we done? We have simply traced back the origin of our dairy products to the action of the atmosphere. In a pound of butter you have not removed anything that could have depleted the soil. In removing the cheese, you take away not only simply the fat, but the casein, which is a nitrogenous part of the milk. Butter-fat consists of three materials—carbon, hydrogen and oxygen. The curd consists, in addition to these three, of nitrogen. When we remove the cheese from the farm, we are taking away a little more than we are in the case of butter, but very little more indeed. It is when we drive away our hay, oats, peas, straw, etc., from the farm that we are impoverishing our land. Dairying has a tendency to improve the fertility of our farms, instead of depleting them; and it is a matter of national importance that the practice of carrying off our grain and hay from our farms should be stopped. In conjunction with dairying, it will pay to produce mutton and wool, pork, and so on, but that which will take least of all from the farm is the pound of butter, because there is practically nothing in it but what has come from the air.

We have gone back to the foundation. The dairyman ought to understand all the relations of his business. As a manufacturer builds his buineass from the bottom upwards, so the dairyman should begin right at the foundation with the soil, seeing that it is in good condition and well drained and cultivated. Then he will see that he grows the proper crops. He will see to the proper housing of them and to the best means of putting them in front of his stock. He will see to the proper utilizing of the by-products, to the handling of the products, to the equipment of factories and the turning out of our dairy products in such a way as to attract the attention of the consumer. I do not know of any manufacturing business that involves so many serious thoughts; that has so much depending upon careful study and observation; that demands so much good calculation, thinking and close reasoning; that so much requires good business methods in order to have a proper understanding of it from bottom to top, as the business af agriculture, and particularly that part of it called dairying. I hope that by what I have said

I may have been able to start some lines of reasoning or thought, not only to your satisfaction and edification, but also to your profit in connection with this very important industry.

Mr. ASHLEY: I would just like to ask Prof. James how he explains the reason for the good crops grown on irrigated lands. In countries where they irrigate the land the water has not got a chance to bring into the soil, oxygen and nitrogen from the atmosphere.

Prof. JAMES: You refer to the western plains, where they are trying to do so much by irrigation. Well, the irrigator in a way has practical control of the weather. That is where the farmer is supreme. He has sunshine all the time and can turn on the rains practically whenever he likes.

Mr. ASHLEY: How does he get the gases from the air?

Prof. JAMES: Well, the rain must have fallen through the air somewhere. Snow will bring them down. They fell somewhere up in the mountains, from which they are carried down with the water for purposes of irrigation.

Mr. LOCKNER: Do you say that the better the cow is fed the richer the milk is in butter-fats?

Prof. JAMES: No; that is a very much disputed point. Of course it is said the richer the food the better the milk must be, but the experience of the various experimental stations seems to be against that theory.

Mr. GRAHAM: How long is it since these experiments were made by which it was found that plants took their nourishment from the atmosphere?

Prof. JAMES: You might say that conclusion has just been arrived at during the last few years.

Mr. GRAHAM: A few years ago I had a newspaper controversy with one of the Professors at the Agricultural College, and he said I might as well try to hang myself up by my boots as try to enrich the soil from that source. It was with reference to growing permanent grasses.

Prof. JAMES: No doubt, as in the case of nearly all newspaper controversies, you did not understand each other. That soil you started with probably had slightly more in at first than at the last, but the material in it was not available. Take a heavy clay soil, which is one of the richest soils you have, but you cannot do anything with it without under-draining. If you fallow a piece of land, by letting it rest in that way, and by cultivation, the air has been working on it all the time. There is no more absolutely in the soil, but there is more readily available for the plants, so that the soil appears to have a great deal more. It is worth more for plant growing.

Mr. BROMER: You say that the production of milk is not exhaustive to land?

Prof. JAMES: No, of butter. The skim milk goes back to the soil through the animals which you feed with it. The soil constituents are in the skim-milk; the air constituents are in the butter, we might say.

CLOSING PROCEEDINGS.

Resolutions of a grateful and complimentary nature were passed to the Mayor and citizens of Belleville, the press, the speakers, and the President.

Moved by Robert Philp, seconded by R. J. Graham, that this Association deeply regrets the absence of our Vice-president, Mr. Wenger, and also of our instructor, Mr. Mark Sprague, through illness, and expresses the hope that they may speedily recover.

The Convention then adjourned.

INSTRUCTOR'S REPORT.

The following is the report of Mr. Mark Sprague, which was not presented at the Convention owing to his illness at the time:

I have much pleasure in herewith presenting my report for the year just ended.

We had under supervision seventy-four creameries, twenty-eight of which were cream gathering. This class of creameries is in some sections the only one practicable on account of the roads being sandy and hilly and patrons not living in close proximity to each other, making the cost of hauling milk to either cheese factories or creameries unprofitable, and they, for these reasons, need all encouragement and assistance it is possible to give. The butter-maker may be ever so skilled in his work, and receive all the teaching the instructor may be able to impart, but it will never enable him to make the class of butter desired from cream some of which has reached the stage of partial decomposition.

On the other hand the farmer and patron must be educated in the best way of raising and caring for his cream, that it may go to the creamery in the best possible condition. Then he must also be educated to place his milk in the very best condition for obtaining all the fat in his milk, and not leave twenty-five per cent. of this valuable commodity in the skim-milk, which is at present the reason why so many patrons of creameries find fault and finally end up with the assertion that "It don't pay," when their profits are lost through improper conditions and improper handling of their milk. As a remedy for this, I would suggest that this Association employ some fully competent and capable person to go in among these people for three months during winter, when the farmers are not busy and can attend such meetings as he might hold. He could hold these meetings according as the proprietors or managers of creameries may deem wise, giving to each creamery a given number, say three or four meetings. In this way these faults may be remedied, and I trust this Board of Management will give the matter their consideration.

The other class of creamery is the separator creamery. They are fast increasing and in the near future will, I think, be nearly as numerous as our cheese factories are now. They must insist on their patrons delivering to the factory only first-class milk which has been properly aerated and the milk of healthy cows, fed on good clean feed, and watered abundantly (the cows, not the milk) with good pure water, just such as one would relish himself. If this be done the butter maker will be enabled to put up a butter capable of demanding as high a price as the far-famed Danish butter. We of Ontario have the proper climate, soil and skill. All it remains to do is to put all of these conditions in unison and all work with the one object in view, and then the farmer or dairyman will not be, as has been the rule for a few years in grain raising—working hard to get money to buy food to make him able to work hard to get more money to buy more food, etc.

As to my work for the past season: I began on the 28th of March and devoted 164 days in all to travelling and visiting the seventy-two factories, giving as nearly as could be two days to each factory, instructing in butter-making, milk testing, etc. I tested over four thousand samples of milk with the Babcock tester and lactometer, and I am pleased to say had but few cases of adulteration. There were, however, a few who either had clung to the idea that they could not be detected, or were not on the look-out for the day when their milk would be examined. But I have been to the annual meetings of their various factories and have seen their ill-gotten gain distributed among their fellow-men *pro rata*, and done subject to an order signed by their own hand, and witnessed by your humble servant, which method seems to have the desired effect, as the cases are getting less each year.

There are a few factories paying by the Babcock test—some five in number—which have been quite satisfactory. As a rule there are always those to find fault, and the creamery is no exception.

I feel that this report is already occupying too much space in your valuable report, and regretting very keenly my not being able to attend the Convention at Belleville, through illness, will close wishing the Ontario Creameries' Association and its officers many years to carry on this very important work.

APPENDIX.

FINANCIAL STATEMENTS.

DAIRYMEN'S ASSOCIATION OF EASTERN ONTARIO.

RECEIPTS.

Cash on hand from previous year	$ 331 69
Members' fees	160 00
Legislative grant	2,750 00
Prosecutions	492 50
Fees from factories	629 50
Napanee, Kingston and Peterborough Boards of Trade	582 75
	$4,946 44

DISBURSEMENTS.

Expenses at Convention	$ 416 50
Officers' salaries	200 00
Directors' fees and expenses	179 34
Printing, postage and stationery	22 80
Advertising	40 00
Instructor's salary and expenses	866 59
Inspectors' salaries and expenses	2,756 65
Cost of reporting	60 00
Balance on hand	404 56
	$4,946 44

DAIRYMEN'S ASSOCIATION OF WESTERN ONTARIO.

RECEIPTS.

Cash balance from 1892	$ 790 57
Members' fees	305 50
Legislative grant	2,750 00
City of London's grant	200 00
Proceeds from advertisements in Convention programme	87 00
Inspector's fees for 1892 per T. B. Millar	245 00
Fines for 1892 per T. B. Millar	51 37
Travelling expenses of Inspector for 1892, received from factories	95 06
Inspector's fees for 1893 per T. B. Millar	205 00
Fines for 1893, for T. B Millar	123 82
Travelling expenses of Inspector for 1893, received from factories	108 55
Travelling expenses of Secretary for 1893, received from factorymen and others	26 65
	$4,988 52

DISBURSEMENTS.

Grant to Western Fair, London		$ 100 00
Grant to Industrial Fair, Toronto		100 00
Expenses of Annual Convention—		
W. D. Hoard, services and expenses	$ 199 15	
Dr. VanSlyke, services and expenses	40 15	
Rent of Hall	30 00	
Decorating Hall for Governor-General's visit	12 00	
C. E. Chadwick, expenses to Convention	8 99	
Cost of reporting	80 00	
Printing programmes and wrappers	81 25	
Printing posters, tickets, etc	14 50	
Badges and rosettes	71 04	
Advertising Convention	50 06	
		497 14

Discount charges		5 03
Expenses of Directors		85 43
Expenses of local conventions and meetings		101 65
Expenses of Dairy School work in April and May		40 80
Expenses of delegates to Toronto, *re* grant		19 00
Expenses of representative to Industrial Fair		35 00
Inspector Millar, part salary and expenses for 1892, as shown in last year's supplementary statement		391 43
Balance of Inspector's account for 1892		154 08
A. T. Bell, salary as Superintendent Dairy School, 1892		500 00
Inspector Millar's salary in full for 1893		700 00
Travelling expenses of Inspector for 1893		192 15
Legal costs 1891, J. C. Hegler *re* Matheson case	$ 42 57	
" " Williams	42 00	
		84 57
Treasurer's salary, 1892		30 00
C. E. Chadwick, one year's gratuity		100 00
Office expenses to December 30, 1893		254 31
Travelling expenses of Secretary to December 30, 1893		248 97
Paid on Secretary's salary account		725 00
Balance		623 96
		$4,988 52

ASSETS.

Balance in Bank	$ 623 96
Office fixtures	30 00
Three Babcock Milk Testers and equipment	40 00
	$693 96

LIABILITIES.

Balance due on Secretary's salary to December 30, 1893	353 57
A. T. Bell's salary as Superintendent Dairy School, 1893	300 00
Balance of assets over liabilities	40 39
	693 96

ONTARIO CREAMERIES ASSOCIATION.

RECEIPTS.

Membership fees	$ 74 00
Donations (subscriptions to *Hoard's Dairyman*)	41 00
Legislative grant	2,000 00
	$2,115 00

DISBURSEMENTS.

Balance due Treasurer per last report	$ 165 43
Grants to societies, fairs, etc	150 00
Expenses for conventions	30 00
Officers' salaries	125 00
Directors' expenses	215 05
Printing, postage and stationery	31 02
Advertising	41 62
Judges' expenses	35 00
Lecturer's expenses	109 00
Inspector and instructor's salary	730 00
" " expenses	329 40
Reporting	40 00
Sundries (including $2 bank commission of Government cheque)	2 95
Balance on hand January 11, 1894	110 53
	$2,115 06

(14) 2425-4

DATE.	NAME O