SESSIONAL PAPERS.

VOL. XXVII.—PART IV.

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OF THE

PROVINCE OF ONTARIO.

SESSION 1895.

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ARRANGED ALPHABETICALLY.

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No. 52.. Report of the Ontario Game and Fish Commission for the year 1894. Presented to the Legislature, 18th March, 1895. *Printed.*

No. 53.. Report of Upper Canada College for the year ending 30th June, 1894. Presented to the Legislature, 15th March, 1895. *Printed.*

No. 54.. General Rules and Orders made by the Court of Appeal for Ontario, respecting the trial of Election Petitions pursuant to the Ontario Controverted Elections Act, R. S. O., chap. 10. Presented to the Legislature, 15th March. 1895. *Printed.*

No. 55.. Report of the Master of Titles for the year 1894 Presented to the Legislature, 18th March, 1895. *Not printed.*

No. 56.. Return to an Order of the House of the seventh day of March, 1894, for a Return shewing what deductions have been made in the past ten years in the amounts payable by any municipality to the Province in respect of Drainage Works, or advances made for such works, giving each municipality separately, with the amount of the original indebtedness and the amount of the reduction made with respect to it, and the authority for such reduction. And shewing also, whether any of such municipalities, and if so, which, are in arrear in respect of the payments to have been made on the reduced indebtedness and the amounts in arrear. Presented to the Legislature, 19th March, 1895. Mr. *Meredith. Printed.*

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No. 60... Report of the Niagara Falls Park and River Railway Company for the year 1894. Presented to the Legislature, 22nd March, 1895. *Not printed.*

No. 61.. Return to an Order of the House of the eleventh day of March, 1895, for a Return of copies of all correspondence relating to the appointment of Alfred Knight as Clerk of the First Division Court of the Counties of Lennox and Addington. Presented to the Legislature, 22nd March, 1895. Mr. *McLaren. Not printed.*

No. 62.. Copy of an agreement between the Inspector of Prisons and Public Charities and Messrs. H. A. Nelson & Sons, relative to the manufacture of brooms at the Central Prison. Also, of an Order in Council approved by His Honour the Lieutenant-Governor the eighteenth day of August, 1894, authorizing the Inspector to execute the said agreement. Presented to the Legislature, 27th March, 1895. *Printed.*

No. 63.. Return to an Order of the House, of the eighth day of March, 1895, for a Return, shewing the number of registrations in each Municipality in the County of Hastings. The number of registrations during the last ten years in the Riding of North Hastings, in the different Municipalities, together with the registrations during the last ten years in the Township of Hungerford. The registration fees during the year 1894 in the Riding of North Hastings and the Township of Hungerford. Presented to the Legislature, 25th March, 1895. Mr. *Haggerty. Not printed.*

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No. 65.. Return to an Order of the House of the eighteenth day of March, 1895, for a Return shewing the cost of the Diamond Drill; the date when operations were begun with it, and the number of days it has been in operation; the hours of the day it is worked; a statement of the work done and where carried on since its purchase and the number of men employed in its use and the rate of wages at which they are engaged. Presented to the Legislature, 28th March, 1895. Mr. *Farwell.* *Not printed.*

No. 66.. Regulations of the Department of Education respecting grants to Schools in New and Poor Townships. Presented to the Legislature, 2nd April, 1895. *Not printed.*

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No. 69.. Return to an Order of the House of the fourteenth day of March, 1894, for a Return of all Coroners' Inquests held under the provisions of the Revised Statutes respecting Coroners, or the Acts consolidated therein, for each of the ten years preceding the first of January, 1880, and for each of the ten years succeeding the same date. The Return to shew the particulars for each year separately, and whether such inquests were held under the provisions of section 3 of the said Revised Statutes, or of sub-section 1 of the 4th section, or of sub-section 2 of the said 4th section thereof. Presented to the Legislature, 5th April, 1895. Mr. *Hudson.* *Not printed.*

No. 70.. Analysis of Reports of County, Township and Horticultural Societies. Presented to the Legislature, 6th April, 1895. *Not printed.*

No. 71.. Return to an Order of the House of the twenty-second day of March, 1895, for a Return, classifying the maintenance expenditures of the Public Institutions of the Province for the year 1893, under heads shewing: (*a*), Expenditure for salaries, wages, etc.; (*b*), Amounts paid for supplies furnished under contract; (*c*), Expenditure for meat supplies under special arrangement; (*d*), Expenditure for other supplies under different heads, indicating the comparative practicability or impracticability of purchasing same by tender, instead of the open market. Presented to the Legislature, 8th April, 1895. Mr. *Hobbs.* *Printed.*

No. 72..	Report of the Bureau of Mines for the year 1894. Presented to the Legislature, 9th April, 1895. *Printed.*
No. 73..	Report of the Provincial Board of Health for the year 1894. Presented to the Legislature, 10th April, 1895. *Printed.*
No. 74..	Report of a Special Committee of the Senate of Toronto University with respect to the Assets and Endowment of the University. Presented to the Legislature, 10th April, 1895. *Printed.*
No. 75..	Report of the Secretary and Registrar of the Province for the year 1894. Presented to the Legislature, 10th April, 1895. *Printed.*
No. 76..	Report of the Board of Governors of the School of Mining and Agriculture, Kingston. Presented to the Legislature, 11th April, 1895. *Printed.*
No. 77..	Return to an Order of the House of the third day of April, 1895, for a Return shewing the names of all officials employed in the Courts, or in connection with the Courts, at Osgoode Hall, Toronto, who are paid wholly, or in part, by fees. The amount of fees collected by each such official, the services for which such fees are charged, amount of fees retained by each of such official for his own use and the amount of fees, if any, paid to the Law Society or to the Province. Presented to the Legislature, 11th April, 1895. Mr. *McPherson.* *Not printed.*

TWENTY-FIFTH ANNUAL REPORT

OF THE

INSPECTOR OF PRISONS AND PUBLIC CHARITIES

UPON THE

HOSPITALS

OF THE

PROVINCE OF ONTARIO.

BEING FOR THE YEAR ENDING 30TH SEPTEMBER,

1894.

PRINTED BY ORDER OF THE LEGISLATIVE ASSEMBLY.

TORONTO:
WARWICK BROS. & RUTTER, PRINTERS, &c., 68 AND 70 FRONT STREET WEST.
1895.

OFFICE OF THE
INSPECTOR OF PRISONS AND PUBLIC CHARITIES, ONTARIO,
PARLIAMENT BUILDINGS, TORONTO, November, 1894.

SIR,—I have the honor to transmit herewith, to be presented to His Honor the Lieutenant-Governor, the Twenty-fifth Annual Report upon the Hospitals, for the official year ending on the 30th September, 1894.

I have the honor to be, Sir,
Your most obedient servant,

T. F. CHAMBERLAIN,
Inspector.

TO THE HONORABLE J. M. GIBSON, M.P.P.,
Secretary of the Province of Ontario,
Toronto.

HOSPITALS

TWENTY-FIFTH ANNUAL REPORT

OF THE

INSPECTOR OF PRISONS AND PUBLIC CHARITIES

OF THE

PROVINCE OF ONTARIO.

PARLIAMENT BUILDINGS,
TORONTO, December, 1894.

To the Honorable GEORGE AIREY KIRKPATRICK, *Lieutenant-Governor of the Province of Ontario.*

MAY IT PLEASE YOUR HONOR:

I beg to submit herewith the Twenty-fifth Annual Report upon the Hospitals of Ontario, being for the official year ending on the 30th September, 1894.

I have the honor to be,
Your Honor's most obedient servant,

T. F. CHAMBERLAIN,
Inspector.

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HOSPITALS.

Two more hospitals have been added to the list during the past year, namely, the Hospital for Sick Children, Ottawa, and the General Protestant Hospital, Chatham, as institutions entitled to provincial aid, under the Statute; and another has applied to be placed on the list the coming year, namely, the General Hospital, Sudbury.

In 1889 there were 18 hospitals receiving aid from the provincial funds while now there are 34, and there are others in process of construction which, when completed, will no doubt apply for like aid, under the Charity Aid Act.

I beg to repeat therefore what I said in my report for the year 1892, namely, that on account of the liberality of the Government in contributing towards the maintenance of these institutions there is a growing tendency to multiply their number. It is a matter worthy of consideration, in view of this yearly increase in institutions and the large sum that is now being given annually from the funds of the Province towards their support, whether the Government should not assume greater powers than it has hitherto exercised as to the necessity for increased hospital accommodation in any locality before new enterprises of the kind are undertaken, by requiring as a condition of their afterwards becoming entitled to aid, that in every case the department be satisfied as to such necessity, and the suitability of location, plans, etc., before entering upon the work of construction.

The amount that the Legislature granted in 1889, was $68,566.46 while the grant for this year is $118,217.40 being an average this year of not less than 36.77 per cent. of the whole cost of maintenance.

Government aid has been given to the hospitals with the object of assisting them in caring for the sick and afflicted of the population of the whole Province, and not for the advantage of any particular locality or institution. In thus aiding these institutions the Government also had in view the encouragement and stimulation of the public to contribute liberally (both privately and municipally) towards the maintenance and the action of the Government has to a great extent had the desired effect. Our hospitals are now so constructed and perfected in their accommodation that they are being patronized by the wealthier classes in cases of sickness, as paying patients. That the revenues of the hospitals have increased greatly from this source as well as from bequests, donations, etc., is not to be denied, and they are now in a much better financial condition than in former years.

It is therefore a question whether under these circumstances and in view of the rapid yearly increase of the appropriation for hospitals, those inmates who are private patients and those who contribute over $3 per week for their care and treatment should not be eliminated from the per capita allowance.

I believe that with proper economy the amount received from paying patients and donations, together with the Government grant of 30 cents limited to all non-paying patients and those who pay less than $3 per week should be sufficient to meet the ordinary maintenance expenses of any hospital.

I am of the opinion that all municipalities in the older sections of the Province should contribute something towards the support of hospitals by way of a yearly grant which would enable them to participate in the benefits of hospital treatment for their indigent sick, and where no such yearly grant is given the municipality should pay to the nearest hospital $2 per week for each sick person coming from such municipality for treatment, for a period not exceeding eight weeks. In such cases the certificate of a duly qualified medical practitioner, showing that the patient is a proper case for treatment, sent to the head officer of the municipality, should be sufficient authority for the removal of the patient to the hospital.

Table No. I shows the number of deaths during the year as compared with 1893. The decrease in the death rate from year to year, excluding periods of severe epidemics, is due to improved methods of sanitary treatment, condition of building, drainage ventilation, nursing, etc.

Table No. VII shows the amounts the Legislature will be asked to vote as a grant to each hospital for the past year, as well as the total of such grants.

Table No. VIII shows the cost of maintenance of each hospital and daily cost per patient.

Table No. IX shows the comparative cost per patient daily for the last eleven years.

In table No. X will be seen the proportion in each case paid by the Government. This ranges from 57.67 per cent. down to 4.40 per cent.

It will be seen by the statements following that the number of patients treated in the various hospitals has greatly increased during the past few years, the rate of increase being far greater than the growth of population. This is owing to the advantages which the hospitals now afford over past years.

In the minutes of my inspections of the hospitals will be found details of the condition of buildings, number of patients, etc.

The following comparative statement shows the numbers treated in all the hospitals in each of the past sixteen years, with the increase or decrease in each successive year as the case may be:

		Increase.	Decrease.
1878	4,372	295	..
1879	4,612	240	..
1880	5,302	690	..
1881	5,257	...	45
1882	6,032	775	..
1883	6,238	206	..
1884	6,369	131	..
1885	6,617	248	..
1886	7,035	418	..
1887	7,522	487	..
1888	8,292	770	.
1889	8,561	269	..
1890	9,187	626	..
1891	10,523	1,336	..
1892	11,404	881	..
1893	12,392	988	..
1894	14,363	1,971	..

TABLE I.—Showing general movements of Patients in each Hospital separately.

Hospitals.	Location.	Number remaining under treatment on 1st Oct., 1893.	Number admitted during the year ending 30th Sept. 1894.	Number of births in Hospitals during the year.	Total number under treatment during the year ending 30th Sept., 1894.	Number discharged during the year	Number who died during the year.	Number remaining under treatment on 30th Sept., 1894.
General Hospital (including the Burnside Lying-in-Branch and the Mercer Eye and Ear Infirmary Branch)	Toronto	236	2,302	128	2,666	2,241	183	242
Homœopathic Hospital	"	31	481	55	570	487	28	55
Hospital for Sick Children	"	91	437	....	528	431	19	78
St. Michael's Hospital	"	51	711	3	765	665	50	50
City Hospital	Hamilton	53	763	28	844	691	81	72
St. Joseph's Hospital	"	19	252	....	271	227	16	28
General Hospital	Kingston	73	748	40	861	754	37	70
Hotel Dieu Hospital	"	40	587	....	627	564	24	39
General Protestant Hospital	Ottawa	42	510	....	552	450	40	62
Roman Catholic Hospital	"	44	776	....	820	674	94	52
House of Mercy Lying-in Hospital	"	37	178	159	374	342	4	28
General Hospital	London	61	574	19	654	550	52	52
St. Joseph's Hospital	"	12	327	....	339	291	16	32
General and Marine Hospital	St. Catharines	32	260	7	299	255	12	32
Galt Hospital	Galt	11	175	3	189	161	15	13
General Hospital	Guelph	33	426	7	466	419	26	21
St. Joseph's Hospital	"	25	309	....	334	304	7	23
General Hospital	Pembroke	15	260	....	275	246	13	16
General Hospital	Mattawa	16	384	....	400	351	12	37
J. H. Stratford Hospital	Brantford	22	295	7	324	272	18	34
St. Joseph's Hospital	Port Arthur	11	112	....	123	104	12	7
Belleville Hospital	Belleville	13	224	3	240	217	10	13
St. Vincent De Paul Hospital	Brockville	11	127	....	138	119	7	12
General Hospital	"	23	195	2	220	186	16	18
General and Marine Hospital	Collingwood	6	50	1	57	51	1	5
Nichol's Hospital	Peterborough	22	282	....	304	257	20	27
St. Joseph's Hospital	"	16	128	....	144	119	11	14
Hotel Dieu Hospital	Windsor	21	141	....	162	122	13	27
St. Joseph's Hospital	Chatham	5	130	....	135	114	8	13
General Hospital	Stratford	13	164	6	183	149	6	28
Amasa Wood Hospital	St. Thomas	8	138	1	147	129	8	10
General and Marine Hospital	Owen Sound	7	59	2	68	57	6	5
Sick Children's Hospital	Ottawa	6	67	1	74	65	3	6
General Hospital	Chatham	1	207	2	210	183	16	11
Total, 1894		1,110	12,779	474	14,363	12,247	884	1,232
Total, 1893		1,107	10,891	503	12,392	10,554	731	1,107

TABLE II.—Showing Sex, Religious Denominations and Nationalities of Patients under treatment in the various Hospitals.

Hospitals.	Location.	Sex.		Religious denominations.			Nationalities.					
		Male.	Female.	Protestants of all denominations.	Roman Catholics.	Unknown.	Canadian.	English.	Irish.	Scotch.	United States.	Other countries.
General Hospital	Toronto	1,5[illegible]0	1,136	2,295	334	37	1,368	665	316	147	92	78
Homœopathic Hospital	"	238	332	481	89	......	289	170	44	38	18	11
Hospital for Sick Children	"	284	244	460	62	6	505	11	6	2	3	1
St. Michael's Hospital	"	390	375	201	561	3	391	85	218	16	39	16
City Hospital	Hamilton	490	354	690	145	9	426	209	92	60	33	24
St. Joseph's Hospital	"	124	147	126	145	......	147	65	43	7	1	8
General Hospital	Kingston	388	473	770	88	3	619	103	53	31	17	8
Hotel Dieu Hospital	"	255	372	115	512	......	492	20	68	10	28	9
General Protestant Hospital	Ottawa	299	253	471	42	39	342	107	48	24	8	23
Roman Catholic Hospital	"	390	430	13	801	6	646	23	113	3	9	26
House of Mercy Lying-in Hospital	"	90	284	131	243	......	127	93	101	41	4	8
General Hospital	London	336	318	568	71	15	377	141	61	36	19	20
St. Joseph's Hospital	"	143	196	185	154	......	240	24	51	12	10	2
General and Marine Hospital	St. Catharines	181	118	221	74	4	174	57	35	7	19	7
Galt Hospital	Galt	101	85	181	8	......	136	20	6	13	9	5
General Hospital	Guelph	237	229	429	35	2	329	51	30	26	18	12
St. Joseph's Hospital	"	140	194	36	298	......	195	18	103	7	1	10
General Hospital	Pembroke	138	137	27	248	......	205	17	39	4	2	8
General Hospital	Mattawa	328	72	76	318	6	227	14	99	8	2	50
J. H. Stratford Hospital	Brantford	177	147	276	41	7	204	66	21	17	6	10
St. Joseph's Hospital	Port Arthur	91	32	73	40	10	38	21	27	5	6	26
Belleville Hospital	Belleville	130	110	201	39	......	157	27	30	12	12	2
St. Vincent De Paul Hospital	Brockville	138	......	66	72	......	77	19	24	9	7	2
General Hospital	"	102	118	204	16	......	170	13	6	5	23	3
General and Marine Hospital	Collingwood	27	30	50	6	1	40	9	4	2	2	...
Nichol's Hospital	Peterborough	154	150	298	6	......	160	77	28	27	11	1
St Joseph's Hospital	"	87	57	14	130	......	58	1	57	2	3	33
Hotel Dieu Hospital	Windsor	65	97	31	129	2	102	12	21	......	20	7
St. Joseph's Hospital	Chatham	57	78	40	95	......	104	6	9	5	11	....
General Hospital	Stratford	90	93	165	18	......	131	27	12	10	......	3
Amasa Wood Hospital	St. Thomas	147	......	138	7	2	90	30	8	7	8	4
General and Marine Hospital	Owen Sound	34	34	61	7	......	46	7	3	5	4	3
Sick Children's Hospital	Ottawa	27	47	63	10	1	40	21	1	......	3	9
General Hospital	Chatham	98	112	108	2	......	165	21	7	7	10	....
Total, 1894	......	7,509	6,854	9,364	4,846	153	8,837	2,250	1,784	605	458	429
Total, 1893	......	6,288	6,104	8,095	4,148	149	7,338	2,025	1,669	616	350	394

TABLE No. III.

Detailed Analysis of the Diseases or Ailments for which Patients received treatment for the year ending 30th September, 1894.

Disease.	Male.	Female.	Not stated.	Total.
Alimentary Canal.				
Colic	24	10	.....	34
Cancrum Oris	...	1	.....	1
Constipation	61	45	1	107
Catarrh of Stomach	1	.....	.....	1
Dysentery	36	31	2	69
Diarrhœa	41	49	.....	90
Dyspepsia and Indigestion	96	124	..	220
Enteritis	17	21	.....	38
Faecal Fistula	...	1	1	2
Fistula-in-ano	29	18	.....	47
Fissure-in-ano	1	1	.....	2
Gastrodynia	4	4	...	8
Gastritis	53	67	2	122
Gastric Dilatation	2	....	....	2
Hæmorrhoids	59	57	.....	116
Hœmatemesis	7	5	.....	12
Intestinal Worms	8	17	.....	25
" Obstruction	3	.....	.....	3
Œsophagus (diseases of)	9	6	.....	15
Pharyngitis	14	17	.....	31
Ptyalism	4	3	.....	7
Perforation of Stomach	....	1	...	1
Peritonitis	37	38	2	77
Prolapse of Rectum	.....	1	2	3
Quinsy	35	15	.....	50
Stomatitis	16	31	1	48
Tonsillitis	72	71	8	151
Typhlitis and Appendecitis	48	17	2	67
Ulceration of Stomach	15	30	.....	45
" Rectum	4	2	.....	6
Stricture of Rectum	.....	3	.....	3
Totals	696	686	21	1,403
Brain and Nervous System.				
Apoplexy	8	5	....	13
Angio-neurotic Œdema	1	1	.....	2
Chorea	12	24	13	49
Convulsions	.....	.....	4	4
Catalepsy	1	1	.....	2
Cerebellar Tumor	2	.....	....	2
Concussion of Brain	21	5	4	30
" Spine	7	2	.....	9
Compression of Brain	7	1	.....	8
" Spine	3	....	.....	3
Delirium Tremens	91	8	.....	99
Epilepsy	32	9	3	44
Hemiplegia	33	25	.....	58
Hysteria	13	81	....	94
Hydrocephalus	.....	.....	2	2
Inflammation of Brain	12	2	.....	14
Insolation	3	1	.....	4
Insomnia	14	24	.....	38
Infantile Paralysis	.....	.....	2	2
Insanity	23	34	.....	57
Lateral Sclerosis	6	.....	.....	6

Disease.	Male.	Female.	Not stated.	Total.
Brain and Nervous System.—Con.				
Locomotor Ataxia	22	1	.....	23
Lumbago	4	2	.....	6
Myelitis	6	1	.....	7
Neuralgia	32	52	.....	84
Neuritis	9	2	3	14
Neuroma	5	3	....	8
Neurasthema	30	47	.....	77
Paralysis, General	41	27	.....	68
" Partial	.....	1	.....	1
Paraplegia	11	9	.....	20
Paralysis, Bell's	1	1	1	3
" Agitans	9	3	.....	12
" Functional	2	1	.....	3
Softening of Brain	8	1	.....	9
Spina Bifida	2	.....	.....	2
Sciatica	36	20	.....	56
Shock	4	1	.....	5
Spinal Curvature	19	21	.....	40
Tubercular Meningitis	10	9	1	20
Simple Meningitis	9	3	.....	12
Tetanus	.....	.....	.....	.....
Sarcoma of Brain	1	.....	.....	1
Totals	550	428	34	1,012
Bones and Joints.				
Anchylosis	7	10	.....	17
Caries	66	34	57	157
Exostosis	.....	3	.....	3
Necrosis	59	25	8	92
Ostitis	12	5	1	18
Periostitis	14	13	1	28
Sarcoma of Femur	1	.....	.....	1
Rickets	5	1	1	7
Arthritis, all kinds	7	7	.....	14
Hæmorrhage into Knee Joint	1	.....	.....	1
Floating Cartilage in Knee Joint	.....	1	.....	1
Synovitis	11	12	.....	23
Hydrops Articular	2	.....	.....	2
Totals	185	111	68	364
Circulation.				
Angina Pectoris	10	8	1	19
Aneurisms	13	5	.....	18
Arterial Sclerosis	2	.....	.....	2
Atheroma of Vessels	5	6	...	11
Cyanosis	2	3	.....	5
Cardiac Neurosis	1	.....	.....	1
Disease of Aortic Valves	14	17	.....	21
" Mitral "	39	17	2	58
" Tricuspid "	3	.....	.....	3
" Pulmonary Artery	4	5	.....	9

TABLE No. III.—*Continued.*

Disease.	Male.	Female.	Not stated.	Total.
Circulation.—Con.				
Ecchymosis	1			1
Endocarditis	9	7		16
Hæmorrhage	2			2
Heart, Dilation of	13	10		23
" Hypertrophy	11	11		22
" Degeneration	8	2		10
" Disease unspecified	13	16		29
Nævus	2	5	1	8
Pericarditis	12	9	1	22
Phlebitis	5	8		13
Phlegmasia Dolens		13		13
Varicose Veins	48	37		85
Varicocele	20			20
Endacteritis	1			1
Totals	238	169	5	412
Dislocations.				
Ankle	13	1	1	15
Bones of the Hand	16			16
" Foot	13	2		15
Clavical	5	6		11
Elbow	12	2		14
Femur	10	4		14
Humerus	7	11		18
Knee	17	1		18
Lower Maxilla	3			3
Patella	4	2		6
Wrist	6	7		13
Not specified	2			2
Totals	108	36	1	145
Ear.				
Foreign Body	1			1
Cophosis	2	1		3
Otorrhæa	4	4		8
Otitis Media	20	10	10	40
Inspissated Cerumen	2			2
Injury of Tympanum	1			1
Polypus	3			3
Mastoid Disease	2	1		3
Totals	35	16	10	61
Eye.				
Amarosis	4	3		7
Atrophy of Optic Nerve	1			1
Amblyophia	3	1		4
Chalazion		1		1
Blepharospasmus		3		3
Blepharitis	3	3		6
Cataract	69	44	2	115
Defective Vision		1		1
Entropion	4	4		8
Ennucleation	7	1		8

Disease.	Male.	Female.	Not stated.	Total.
Eye.—Con.				
Ectropion	7	5	2	14
Choroiditis	2	2		4
Foreign Body in the Eye	14	2		16
Dislocation of Lens	1	1		2
Glaucoma	7	6		13
Hypermetropia	2			2
Iritis	36	18		54
Injury	14	4	1	19
Keratitis	30	18	2	50
Iridectomy		1		1
Leucoma	3	4		7
Myopia	1		1	2
Ophthalmia	14	20		34
" Catarrhal	19	3	4	26
" Purulent	14	5	10	29
" Granular	19	19	7	45
" Gonorrheal	8	5	6	19
Orbital Cancer	1	1		2
Pterygium	3	3		6
Lachrymal Fistula		2		2
Retinitis	5	1		6
Conjunctivitis	2	1		3
Sclerotitis	2	2		4
Ptosis			1	1
Staphyloma	3			3
Strabismus	12	19	5	36
Symblepharon		1		1
Trichiasis Ciliorum		2		2
Ulcer of Cornea	21	16		37
Mucocele			1	1
Nebula		1		1
Optic Neuritis	2			3
Dacryocystitis	1		2	3
Totals	334	223	44	601
Fractures.				
Bones of the Head and Face	30	2	1	33
Bones of the Hand	28	4		32
" Foot	28	4		32
" Pelvis	7			7
Clavical	26	7	2	35
Femur	49	20	5	74
Fibula (including Pott's Fracture)	27	18	1	46
Humerus	24	7	3	34
Patella	8	3		11
Ribs	44	10		54
Radius	25	5	2	32
Scapula	7	3		10
Sternum	3	1		4
Tibia	50	7	1	58
Ulna	16	6		22
Ulna and Pelvis	1			1
Vertibra	7	3		10
Ununited Fracture	1	1		2
Unspecified Fracture		1		1
Tibia and Fibula	15			15
Totals	396	102	15	513

TABLE No. III.—*Continued.*

Disease.	Male.	Female.	Not stated.	Total.
Liver.				
Abscess of Liver	7	6	.....	13
Acute Atrophy of Liver	4	2	....	6
Cirrhosis	13	4	.....	17
Fatty Liver	9	5	.....	14
Gall Stones	9	10	.....	19
Hepatitis	22	7	.....	29
Hydatds of Liver	1	.....	.....	1
Jaundice	18	21	.....	39
Waxy Liver	5	4	.....	9
Congestion	1	.....	.....	1
Malignant Disease	1	4	.....	5
Biliary Fistula	.....	1	...	1
Totals	90	64	.....	154
Nose, Face and Throat.				
Abscess of Frontal Sinus	...	1	.....	1
Catarrh	31	28	2	61
Deviation of Septum	.....	.....	.....	.....
Epulis	1	3	.....	4
Foreign Body in Trachea	1	.....	....	1
Epistaxis	17	7	....	24
Hypertrophy of Turbinates	1	....	.....	1
Lipoma	1	1	.....	2
Laryngitis	6	5	....	11
Ozæna	2	.....	....	2
Rhinitis	2	1	....	3
Polypus	5	9	2	16
Cleft Palate	....	1	5	6
Paralysis of Vocal Cord	1	....	.....	1
Retro Pharyngeal Abscess	1	.....	.....	1
Post Nasal Adenoids	3	...	....	3
Hare Lip	4	1	9	14
Totals	76	57	18	151
Poisons.				
Gases	1	.....	.....	1
Irritant	1	5	.....	6
Lead Poisoning	2	.....	.....	2
Narcotic	6	2	.....	8
Narcoto-Irritant	.....	.....	.....	.....
Corrosives	1	.....	.....	1
Toxæmia	.....	1	.....	1
Totals	11	8	...	19
Respiratory Organs.				
Asthma	36	23	1	60
Bronchitis, Acute	123	111	20	254
" Chronic	60	44	5	109
Croup	15	13	6	34
Emphysema of Lung	19	13	.....	32
Empyema	19	10	4	33

Disease.	Male.	Female.	Not stated.	Total.
Respiratory Organs.—Con.				
Hydrothorax	14	5	.....	19
Hæmoptysis	3	.....	..	3
Pneumonia	124	96	10	230
" Pleuro	31	10	.....	41
" Typho	8	4	....	12
" Broncho	22	15	15	52
Pleurisy	74	47	4	125
Phthisis	153	122	14	289
Pleurodynia	13	8	.....	21
Tuberculosis	42	33	.....	75
Totals	756	554	79	1,389
Spleen.				
Splenitis	1	6	....	7
Waxy Spleen	6	2	.....	8
Rupture of Spleen	1	.....	.....	1
Infarct of Spleen	.....	1	.....	1
Totals	8	9	.....	17
Skin and its Appendages.				
Acne	8	4	.....	12
Boils	19	14	....	33
Burns and Scalds	36	29	11	76
Chilblains	6	2	.....	8
Carbuncle	15	8	.....	23
Corns and Bunions	7	5	....	12
Dermatitis	1	.....	....	1
Elephantiasis	1	2	.....	3
Eczema	53	44	23	120
Erythema	8	9	.....	17
" Gangrenosa	1	1	.....	2
Frost Bites	28	1	.....	29
Favus	.....	1	1	2
Herpes	3	4	....	7
Impetigo	2	1	10	13
Intertrigo	2	4	.....	6
Lupus	4	6	.....	10
Lichen	2	2	.....	4
Onychia	2	.....	....	2
Pemphigus	1	.....	1	2
Pruritus	3	4	.....	7
Pediculi	6	2	.....	8
Pityriasis	4	1	...	5
Psoriasis	3	4	2	9
Roseola	5	2	.....	7
Rupia	1	.....	..	1
Ringworm	17	4	.....	21
Scabies	14	10	...	24
Sycosis	5	.....	1	6
Sebaceous Cyst	1	2	....	3
Urticaria	4	4	....	8
Whitlow	13	4	....	17
Ingrowing Toe Nail	5	2	.....	7
Totals	280	176	49	505

TABLE No. III.—*Continued.*

Disease.	Male.	Female.	Not stated.	Total.
Genito-Urinary Organs.				
Bright's Disease, Acute	26	33		59
" Chronic	52	25		77
" Unspecified	1			1
Balanitis	4	3		7
Bubo	14	7		21
Carcinoma of Bladder		1		1
Cystitis	78	49		127
Chancroids	1	1		2
Condyloma	6	2		8
Caruncle of Urethra		1		1
Diabetes Mellitus	17	2		19
" Insipidus	2	1		3
Enlarged Prostrate	31			31
Epididymitis	18			18
Floating Kidney	4	7		11
Gonorrhœa	52	34	1	87
Gleet	1			1
Hydrocele	10	1	1	12
Hydronephrosis	1	1		2
Hæmatocele	1	4		5
Hæmaturia	1			1
Incontinence of Urine	9	14	3	26
Orchitis	16			16
Pyelitis	5	7		12
Prostatis	6			6
Phymosis	11		10	21
Paraphymosis	7			7
Rupture of Urethra	3			3
Retention of Urine	26	10		36
Rupture of Bladder	1			1
Supurative Nephritis	14	5	3	22
Stricture	63			63
Spermatorrhœa	4	2		6
Tumor of Bladder	2			2
Urinary Calculus	45	3		48
" Fistula	2			2
Urethritis, Simple	1	1		2
Uræmia		2		2
Testicular Calculus	1			1
Trichiasis	2			2
Totals	538	216	18	772
Women.				
Imperforate Hymen		1		1
Amenorrhœa		24		24
Menopause		1		1
Abortion		28		28
Cyst of Labia		4		4
Dysmenorrhœa		34		34
Dermoid Cyst		1		1
Erosion of Os Uteri		56		56
Eclampsia		3		3
Fistula, Recto-Vaginal		8		8
" Vesico-Vaginal		5		5
Lacerated or Ruptured Perineum		21		21
Metritis and Endometritis		112		112
Leucorrhœa		10		10
Menorrhagia		28		28

Disease.	Male.	Female.	Not stated.	Total.
Women.—Con.				
Metrorrhagia		1		1
Ovarian Disease		162		162
Pyosalpinx		11		11
Parturition		377		377
Retained Placenta		1		1
Premature Labor		17		17
Rectocele		4		4
Uterus, Anteversion of		19		19
" Retroversion of		51		51
" Anteflection of		10		10
" Retroflection of		17		17
" Curettement of		30		30
" Inversion of		15		15
" Subinvolution		5		5
" Prolapsus of		24		24
Vaginitis		5		5
Womb, Polypus of		22		22
" Fribroid of		40		40
" Cancer of		46		46
Salpingitis		13		13
Stenosis of Cervix		23		23
Laceration of Cervix		86		86
Erosion of Cervix		3		3
Vomiting of Pregnancy		1		1
Totals		1,319		1,319
Zymotic and General.				
Anæmia	31	184		215
Anasarca	7	3		10
Chicken Pox	2			2
Cholera, Asiatic	5			5
" Morbus	4	9		13
" Infantum	6	12		18
Chlorosis		55		55
Diphtheria	183	228	5	416
Dropsy	38	30		68
Erysipelas	57	38	1	96
Fever, Intermittent	46	35		81
" Remittent	8	13		21
" Scarlet	56	69	2	127
" Pernicious	5	1		6
" Typho-Malarial	27	20		47
" Typhoid	412	294	23	729
" Ephemeral	1	2		3
" Cerebro-Spinal	4			4
" Puerperal		10		10
" Continued	9	7		16
Gout	7	4		11
Influenza	148	203		351
Leucocythemia	6	3	1	10
Measles	22	29		51
Mumps	10	5		15
Pyæmia Scepticæmia	13	18		31
Purpura			1	1
Rheumatism, Acute	148	102	5	255
" Chronic	77	52		129
" Muscular	4	3		7
" Gonorrhœal	28	4		32
" Unspecified	28	5		33
Smallpox	3			3
Scrofula	7	10		17

TABLE No. III.—*Concluded.*

Disease.	Male.	Female.	Not stated.	Total.
Zymotic and General.—Con.				
Syphilis, Primary	16	12	......	28
" Secondary	28	27	......	55
" Tertiary	21	14	......	35
" Hereditary	5	6	......	11
" Unspecified	28	26	......	54
Vaccination	230	199	......	429
Whooping Cough	7	4	......	11
Tuberculosis, not elsewhere classed	18	6	......	24
Strumous Glands	3	2	10	15
Totals	1,758	1,744	48	3,550
Miscellaneous, not otherwise classed.				
Abscess, General	111	72	20	203
" Psoas	6	11	......	17
" of Breast	1	21	......	22
" Pelvic	......	5	......	5
Alcoholism	186	30	......	216
Amputations	91	22	......	113
Cancer, Epilethial	50	36	4	90
Encephaloid	11	......	......	11
" Schirrus	18	45	......	63
" Melanotic	3	2	......	5
Contusions	84	21	......	105
Cancers, unclassified	41	44	......	85
Syncope	1	......	......	1
Mastititis	......	4	......	4
Masturbation	1	......	......	1
Marasmus	4	......	......	4
Genu Valgum	......	......	3	3
Microcephalus	......	......	2	2

Disease.	Male.	Female.	Not stated.	Total.
Miscellaneous, not otherwise classed.—Con.				
Cellulitis	11	21	......	32
Coxalgia	15	12	......	27
Debility	117	121	13	251
Goitre	5	16	......	21
Gangrene	16	9	2	27
Gunshot Wounds	24	......	......	24
Hernia	58	35	17	110
Cystocele	1	......	......	1
Injuries not otherwise classed	213	64	15	292
Sprains	41	26	1	68
Tumors, Fibriod	3	43	......	46
" Fatty	14	14	......	28
" Cartilaginous	2	8	2	12
" Cystic	5	30	2	37
" Other	49	29	1	79
Tetanus	3	......	......	3
Talipes	12	7	28	47
Ulcers	135	117	9	261
Periadenitis	1	......	......	1
Foreign Body in Foot	1	......	......	1
" Wrist	1	......	......	1
Deformity of Toes	......	2	......	2
Lymphangitis	2	......	......	2
Diseases not otherwise classed	5	7	75	87
Torticollis	3	......	......	3
Pelvic Cellulitis	......	4	......	4
Morphia Habit	......	5	......	5
Adenoids	......	......	3	3
Ranula	......	......	1	1
Ganglia	......	......	1	1
Totals	1,345	883	199	2,427
Grand Totals	7,404	6,801	609	14,814

TABLE IV.—Shewing the collective stay in days of the adult and infant patients; also, the average length of time each patient was under treatment.

Names of Hospitals.	Location.	Number of patients, including infants born.	Collective stay of infants under one year of age.	Collective stay of adult patients.	Total collective stay of adults and infants.	Average stay of each patient, including the infants.
General Hospital	Toronto	2,666	2,080	81,341	83,421	31
Homœopathic Hospital	"	570	1,353	15,029	16,382	28
Hospital for Sick Children	"	528	......	28,152	28,152	53
St. Michael's Hospital	"	765	.....	20,616	20,616	27
City Hospital	Hamilton	844	768	24,613	25,411	30
St. Joseph's Hospital	"	271	.....	7,658	7,658	28
General Hospital	Kingston	861	630	20,415	21,045	21
Hotel Dieu Hospital	"	627	....	18,978	18,978	30
General Protestant Hospital	Ottawa	552	......	21,871	21,871	39
Roman Catholic Hospital	"	820	.....	21,215	21,245	26
House of Mercy Lying-in Hospital	"	374	294	11,805	12,099	32
General Hospital	London	654	355	19,481	19,836	30
St. Joseph's Hospital	"	339	......	9,031	9,031	26
General and Marine Hospital	St. Catharines	299	268	9,828	10,096	34
Galt Hospital	Galt	189	81	4,611	4,692	24
General Hospital	Guelph	466	153	11,522	11,675	25
St. Joseph's Hospital	"	334	......	11,229	11,229	33
General Hospital	Pembroke	275	......	7,014	7,044	25
General Hospital	Mattawa	400	.. ..	7,530	7,530	19
J. H. Stratford Hospital	Brantford	324	120	7,991	8,111	25
St. Joseph's Hospital	Port Arthur	123	... ..	3,216	3,216	26
Belleville Hospital	Belleville	240	111	6,218	6,329	26
St Vincent De Paul Hospital	Brockville	138	......	5,334	5,334	38
General Hospital	"	220	63	6,951	7,014	32
General and Marine Hospital	Collingwood	57	61	2,785	2,846	49
Nichol's Hospital	Peterborough	304	15	10,033	10,048	33
St. Joseph's Hospital	"	144	23	2,885	2,908	20
Hotel Dieu Hospital	Windsor	162	......	6,163	6,163	38
St. Joseph's Hospital	Chatham	135	3	3,876	3,879	28
General Hospital	Stratford	183	169	6,985	7,154	39
Amasa Wood Hospital	St. Thomas	147	29	2,788	2,817	19
General and Marine Hospital	Owen Sound	68	17	1,899	1,916	28
Sick Children's Hospital	Ottawa	74	10	2,257	2,267	30
General Hospital	Chatham	210	64	5,312	5,376	25
Total, 1894		14,363	6,667	426,722	433,389	30
Total, 1893		12,392	7,365	382,335	389,700	31

TABLE V.—Shewing the deductions which have to be made from the collective stay of the patients for the protracted residence of incurable and lying-in cases. For persons coming within these classes only seven cents per day are allowed.

Names of Hospitals.	Location.	Collective days' stay, exclusive of infants under one year of age.	Deduct for incurables and lying-in cases, for which only Refuge rate is to be allowed.	Number of days' stay for which Hospital allowance is to be made.
General Hospital	Toronto	81,341	2,689	78,652
Homœopathic Hospital	"	15,029	797	14,232
Hospital for Sick Children	"	28,152	2,249	25,903
St. Michael's Hospital	"	20,616	982	19,634
City Hospital	Hamilton	24,643	2,207	22,436
St. Joseph's Hospital	"	7,658	492	7,166
General Hospital	Kingston	20,415	3,665	16,750
Hotel Dieu Hospital	"	18,978	386	18,592
General Protestant Hospital	Ottawa	21,871	5,656	16,215
Roman Catholic Hospital	"	21,245	3,840	17,405
House of Mercy Lying-in Hospital	"	11,805	5,546	6,259
General Hospital	London	19,481	2,453	17,028
St. Joseph's Hospital	"	9,031	847	8,184
General and Marine Hospital	St. Catharines	9,828	347	9,481
Galt Hospital	Galt	4,611	80	4,531
General Hospital	Guelph	11,522	566	10,956
St. Joseph's Hospital	"	11,229	131	11,098
General Hospital	Pembroke	7,044	77	6,967
General Hospital	Mattawa	7,530	94	7,436
J. H. Stratford Hospital	Brantford	7,991	704	7,287
St. Joseph's Hospital	Port Arthur	3,216	147	3,069
Belleville Hospital	Belleville	6,218	192	6,026
St. Vincent De Paul Hospital	Brockville	5,334	19	5,315
General Hospital	"	6,951	1,216	5,735
General and Marine Hospital	Collingwood	2,785	976	1,809
Nichol's Hospital	Peterborough	10,033	652	9,381
St Joseph's Hospital	"	2,885	....	2,885
Hotel Dieu Hospital	Windsor	6,163	1,651	4,512
St. Joseph's Hospital	Chatham	3,876	392	3,484
General Hospital	Stratford	6,985	650	6,335
Amasa Wood Hospital	St. Thomas	2,788	54	2,734
General and Marine Hospital	Owen Sound	1,899	85	1,814
Sick Children's Hospital	Ottawa	2,257	....	2,257
General Hospital	Chatham	5,312	246	5,066
Total, 1894		426,722	40,088	386,634
Total, 1893		382,335	30,292	352,043

TABLE VI.—Relative to Income of Hospitals.

Names of Hospitals.	Location.	Amounts received from municipalities as a grant and for patients' maintenance.	Amount received from patients for board.	Amount received as income from property or investments belonging to hospitals.	Subscriptions and donations of private individuals and incidental receipts.	Total receipts from all sources other than the Government grant.	One-fourth of such receipts.	Amount of the 10 cents per day additional grant.
		$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
General Hospital	Toronto	17,667 25	15,992 86	18,350 38	5,138 27	57,148 76	14,287 19	7,865 20
Homœopathic Hospital	"	3,797 00	5,496 79	455 00	4,134 08	13,882 87	3,470 72	1,423 20
Hospital for Sick Children	"	5,094 80	1,340 83	69 00	20,292 22	26,796 85	6,699 21	2,590 30
St. Michael's Hospital	"	3,464 80	3,752 92		3,108 49	10,326 21	2,581 55	1,963 40
City Hospital	Hamilton	25,799 68				25,799 68	6,449 92	2,243 60
St. Joseph's Hospital	"		1,990 50	640 00	8,575 85	11,206 35	2,801 59	716 60
General Hospital	Kingston	1,745 00	3,689 08	220 60	17,495 84	23,150 52	5,787 63	1,675 00
Hotel Dieu Hospital	"	162 50	2,151 81	322 50	6,032 84	8,669 65	2,167 41	1,859 20
General Protestant Hospital	Ottawa	1,680 10	2,116 79	575 25	5,309 15	9,681 29	2,420 32	1,621 50
Roman Catholic Hospital	"	1,450 00	2,187 87	300 00	2,769 60	6,707 47	1,676 86	1,740 50
House of Mercy Lying-in Hospital	"		1,026 00	12 05	5,517 77	6,555 82	1,638 95	625 90
General Hospital	London	9,170 41	3,518 68	454 78		13,143 87	3,285 97	1,702 80
St. Joseph's Hospital	"		3,038 42		619 40	3,657 82	914 45	818 40
General and Marine Hospital	St. Catharines	1,687 10	1,562 80	40 78	664 06	3,954 74	988 68	948 10
Galt Hospital	Galt	2,000 00	1,712 70		698 73	4,411 43	1,102 86	453 10
General Hospital	Guelph	1,500 00	3,937 50		5,288 05	10,725 55	2,681 39	1,095 60
St. Joseph's Hospital	"	900 00	634 02	300 00	590 93	2,424 95	606 23	1,109 80
General Hospital	Pembroke	250 00	1,442 40		1,352 81	3,045 21	761 30	696 70
General Hospital	Mattawa	50 00	1,493 61		1,581 70	3,125 31	781 32	743 60
J. H. Stratford Hospital	Brantford	1,500 00	938 75		1,488 62	3,927 37	981 84	728 70
St. Joseph's Hospital	Port Arthur	800 00	214 00		300 00	1,314 00	328 50	306 90
Belleville Hospital	Belleville	517 00	1,572 60		2,615 77	4,705 37	1,176 36	602 60
St. Vincent de Paul Hospital	Brockville	100 00	996 52		982 48	2,079 00	519 75	531 50
General Hospital	"	400 00	2,307 28	325 35	1,558 68	4,591 31	1,147 83	573 50
General and Marine Hospital	Collingwood	280 00	678 20		434 81	1,393 01	348 25	180 90
Nichol's Hospital	Peterborough	1,800 00	1,383 05	4,058 00	2,016 33	9,257 38	2,314 34	938 10
St. Joseph's Hospital	"		440 50		1,095 33	1,535 83	383 96	288 50
The Hotel Dieu Hospital	Windsor	406 91	1,830 19		2,721 84	4,958 94	1,239 73	451 20
St. Joseph's Hospital	Chatham	122 87	1,167 17		489 50	1,779 54	394 88	348 40
General Hospital	Stratford	1,300 00	2,388 14		1,722 46	5,410 60	1,352 65	633 50
Amasa Wood Hospital	St. Thomas	2,000 00	1,095 20		51 00	3,146 20	786 55	273 40
General and Marine Hospital	Owen Sound	91 66	655 81		988 78	1,736 25	434 06	181 40
Sick Children's Hospital	Ottawa		1,134 40		1,966 00	3,100 40	775 10	225 70
General Hospital	Chatham	288 50	1,856 00		935 73	3,080 23	770 06	506 60
Total, 1894		86,025 58	75,743 39	26,123 69	108,537 12	296,429 78	74,057 41	38,663 40
Total, 1893		76,066 94	70,316 32	32,668 58	91,204 39	270,356 23	67,311 93	35,204 30

TABLE VII.—Shewing the basis upon which statutory aid is granted.

Names of Hospitals.	Location.	Collective days' stay upon which allowance at Hospital rates is based.	Collective days' stay upon which allowance at Refuge rates is based.	Fixed allowance at 20 cents per day.	Supplementary allowance of one-fourth of amount received from all sources other than Government.	Supplementary allowance at 10 cents per day.	Allowance of 7 cents per day, being Refuge rate for improper cases for Hospital treatment.	Total Government allowance to each Hospital for the year 1894.
				$ c.	$ c.	$ c.	$ c.	$ c.
General Hospital	Toronto	78,652	2,689	15,730 40	...	7,865 20	188 23	23,783 83
Homœopathic Hospital	"	14,232	797	2,846 40	...	1,423 20	55 79	4,325 39
Hospital for Sick Children	"	25,903	2,249	5,180 60	...	2,590 30	157 43	7,928 33
St. Michael's Hospital	"	19,634	982	2,926 80	...	1,963 40	68 74	5,958 94
City Hospital	Hamilton	22,436	2,207	4,487 20	...	2,243 60	154 49	6,885 29
St. Joseph's Hospital	"	7,166	492	1,433 20	...	716 60	34 41	2,184 24
General Hospital	Kingston	16,750	3,665	3,350 00	...	1,675 00	256 55	5,281 55
Hotel Dieu Hospital	"	18,592	386	3,718 40	...	1,859 20	27 02	5,604 62
General Protestant Hospital	Ottawa	16,215	5,656	3,243 00	...	1,621 50	395 92	5,260 42
Roman Catholic Hospital	"	17,405	3,840	3,481 00	1,676 86	...	268 80	5,426 66
House of Mercy Lying-in Hospital	"	6,259	5,546	1,251 80	...	625 90	388 22	2,265 92
General Hospital	London	17,028	2,453	3,405 60	...	1,702 80	171 71	5,280 11
St. Joseph's Hospital	"	8,184	847	1,636 80	...	818 40	59 29	2,514 49
General and Marine Hospital	St. Catharines	9,481	347	1,896 20	...	948 10	24 29	2,868 59
Galt Hospital	Galt	4,531	80	906 20	...	453 10	5 60	1,364 90
General Hospital	Guelph	10,956	566	2,191 20	...	1,095 60	39 62	3,326 42
St. Joseph's Hospital	"	11,098	131	2,219 60	606 23	...	9 17	2,835 00
General Hospital	Pembroke	6,967	77	1,393 40	...	696 70	5 39	2,095 49
General Hospital	Mattawa	7,436	94	1,487 20	...	743 60	6 58	2,237 38
J. H. Stratford Hospital	Brantford	7,287	701	1,457 40	...	728 70	49 28	2,235 38
St. Joseph's Hospital	Port Arthur	3,069	147	613 80	...	306 90	10 29	930 99
Belleville Hospital	Belleville	6,026	192	1,205 20	...	602 60	13 44	1,821 24
St. Vincent De Paul Hospital	Brockville	5,315	19	1,063 00	519 75	...	1 33	1,584 08
General Hospital	"	5,735	1,216	1,147 00	...	573 50	85 12	1,805 62
General and Marine Hospital	Collingwood	1,809	976	361 80	...	180 90	68 32	611 02
Nichol's Hospital	Peterborough	9,381	652	1,876 20	...	938 10	45 64	2,859 94
St. Joseph's Hospital	"	2,885	...	577 00	...	288 50	...	865 50
The Hotel Dieu Hospital	Windsor	4,512	1,651	902 40	...	451 20	115 57	1,469 17
St. Joseph's Hospital	Chatham	3,484	392	696 80	...	348 40	27 44	1,072 64
General Hospital	Stratford	6,335	650	1,267 00	...	633 50	45 50	1,946 00
Amasa Wood Hospital	St. Thomas	2,734	54	546 80	...	273 40	3 78	823 98
General and Marine Hospital	Owen Sound	1,814	85	362 80	...	181 40	5 95	550 15
Sick Children's Hospital	Ottawa	2,257	...	451 40	...	225 70	...	677 10
General Hospital	Chatham	5,066	246	1,013 20	...	506 60	17 22	1,537 02
Total, 1894	...	386,634	40,188	77,326 80	2,802 84	35,281 60	2,806 16	118,217 40
Total, 1893	...	352,043	30,292	70,408 60	1,825 17	32,995 00	2,120 44	107,349 21

TABLE VIII.—Shewing the cost of maintaining the Hospitals; also, the average daily cost per patient, etc.

Hospitals.	Location.	Total days' stay (excluding infants under one year of age).	Cost of dietaries.	Salaries, fuel, light, medicines, bedding, and all other expenditure on maintenance account.	Total expenditures for maintenance.	Average cost of each patient per day.
			$ c.	$ c.	$ c.	cents.
General Hospital	Toronto	81,341	25,752 93	43,802 91	69,555 87	85.50
Homœopathic Hospital	"	15,029	2,945 20	9,930 42	12,875 62	85.67
Hospital for Sick Children	"	28,152	5,792 82	15,670 41	21,463 23	76.24
St. Michael's Hospital	"	20,616	5,206 73	8,509 56	13,716 29	66.53
City Hospital	Hamilton	24,643	7,407 47	15,004 44	22,411 91	90.94
St. Joseph's Hospital	"	7,658	1,940 57	2,791 42	4,731 99	61.79
General Hospital	Kingston	20,415	4,669 13	12,835 02	17,504 15	85.74
Hotel Dieu Hospital	"	18,978	5,472 10	6,595 70	12,067 80	63.58
General Protestant Hospital	Ottawa	21,871	3,406 43	10,832 76	14,239 19	65.10
Roman Catholic Hospital	"	21,245	5,072 85	7,322 43	12,395 28	58.31
House of Mercy Lying-in Hospital	"	11,805	3,022 85	4,114 99	7,137 84	60.46
General Hospital	London	19,481	5,257 81	12,603 16	17,860 97	91*68
St. Joseph's Hospital	"	9,031	1,788 00	2,583 67	4,371 67	48.40
General and Marine Hospital	St. Catharines	9,828	2,136 72	3,651 52	5,788 24	58.89
Galt Hospital	Galt	4,611	1,089 99	3,318 61	4,408 60	95.61
General Hospital	Guelph	11,522	2,551 58	7,234 21	9,785 79	84.93
St. Joseph's Hospital	"	11,229	2,167 40	2,630 10	4,797 50	42 72
General Hospital	Pembroke	7,014	1,864 79	2,761 43	4,626 22	65.67
General Hospital	Mattawa	7,530	2,052 87	2,075 32	4,128 19	54.82
J. H. Stratford Hospital	Brantford	7,991	1,832 23	4,367 95	6,200 18	77.58
St. Joseph's Hospital	Port Arthur	3,216	1,239 06	1,569 55	2,808 61	87.33
Belleville Hospital	Belleville	6,218	1,428 30	4,637 89	6,066 19	97.54
St. Vincent de Paul Hospital	Brockville	5,334	1,279 91	1,511 62	2,791 53	52.33
General Hospital	"	6,951	2,030 03	3,727 31	5,757 34	82.82
General and Marine Hospital	Collingwood	2,785	484 83	1,213 12	1,697 95	60.96
Nichol's Hospital	Peterborough	10,033	1,893 01	5,732 15	7,625 16	76.00
St. Joseph's Hospital	"	2,885	629 56	1,778 44	2,408 00	83.46
The Hotel Dieu Hospital	Windsor	6,163	1,257 21	1,895 76	3,152 97	51.15
St. Joseph's Hospital	Chatham	3,876	1,298 59	1,455 45	2,754 04	71.05
General Hospital	Stratford	6,985	1,449 09	3,840 08	5,289 17	75.72
Amasa Wood Hospital	St. Thomas	2,783	840 48	2,122 72	2,963 20	$1.06.28
General and Marine Hospital	Owen Sound	1,899	555 26	1,216 25	1,771 51	93.28
Sick Children's Hospital	Ottawa	2,257	840 31	2,679 80	3,520 11	$1.55.96
General Hospital	Chatham	5,312	911 63	1,889 50	2,801 13	52.73
Total, 1894		426,722	107,567 74	213,905 70	321,473 44	75.33½
Total, 1893		352,043	99,732 02	197,928 20	297,660 22	84.55

TABLE IX.—Showing the comparative cost per patient daily in the different Hospitals for a period of years.

Hospitals.	Location.	1885	1886	1887	1888	1889	1890	1891	1892	1893	1894
		cents.	cents.	cents.	cents.	cents.	cents.	cents.	cents.	cents.	cents.
General Hospital	Toronto	85.71	77.71	73.24	84.35	85.00	78.98	81.07	85.15	91.03	85.50
Homœopathic Hospital	"	......	......	......	......	......	99.70	71.85	94.34	61.70	85.67
Hospital for Sick Children	"	......	......	......	......	......	......	79.82	$1 39.21	61.37	76.24
St. Michael's Hospital	"	......	......	......	......	......	......	......	......	63.21	66.53
City Hospital	Hamilton	59.22	62.70	66.00	68.55	66.13	74.24	94.27	93.06	$1 16.39	90.94
St. Joseph's Hospital	"	......	......	......	......	......	......	67.33	43.70	54.42	61.79
General Hospital	Kingston	53.00	48.09	56.42	64.06	58.79	53.66	62.03	59.37	90.92	85.74
Hotel Dieu Hospital	"	45.54	54.85	44.10	49.98	44.55	48.83	50.63	46.31	66.53	63.58
General Protestant Hospital	Ottawa	47.80	49.67	62.00	53.11	59.34	73.02	58.50	71.45	$1 02.58	65.10
Roman Catholic Hospital	"	52.94	41.09	46.12	49.40	56.79	46.60	68.57	64.81	71.05	58.34
House of Mercy Lying-in Hospital	"	47.17	39.58	32.81	28.84	49.29	50.48	47.82	42.79	$1 31.45	60.46
General Hospital	London	62.72	67.83	73.96	59.51	94.95	88.29	88.51	94.54	$1 09.14	91.68
St. Joseph's Hospital	"	......	......	......	......	......	......	38.69	25.87	59.39	48.40
General and Marine Hospital	St. Catharines	81.85	60.07	63.43	69.38	67.12	81.06	79.32	68.70	78.72	58.89
Galt Hospital	Galt	......	......	......	......	......	......	$2 07.74	$1 06.83	96.10	95.61
General Hospital	Guelph	64.41	90.87	66.40	63.04	68.41	77.69	73.92	82.55	94.60	84.93
St. Joseph's Hospital	"	57.05	49.02	52.34	48.52	41.66	43.57	55.35	47.43	64.36	42.72
General Hospital	Pembroke	65.63	77.67	67.75	85.57	58.46	67.00	60.98	62.37	81.56	65.67
General Hospital	Mattawa	68.88	94.39	56.98	72.81	64.10	77.90	69.20	53.42	78.65	54.82
J. H. Stratford Hospital	Brantford	$1 23.09	71.51	58.17	68.25	52.38	59.78	70.37	62.15	71.33	77.58
St. Joseph's Hospital	Port Arthur	47.06	55.12	61.17	47.80	49.53	60.00	45.61	54.80	54.00	87.33
Belleville Hospital	Belleville	......	......	44.12	74.96	$1 05.00	85.70	79.82	75.81	$1 09.54	97.54
St. Vincent De Paul Hospital	Brockville	......	......	......	......	34.29	28.23	50.77	49.98	55.82	52.33
General Hospital	"	......	......	......	......	$1 32.00	97.46	66.65	69.56	$1 02.38	82.82
General and Marine Hospital	Collingwood	......	......	......	......	......	$1 01.00	$1 24.29	86.11	86.38	60.96
Nichol's Hospital	Peterborough	......	......	......	......	......	$2 11.00	$1 34.22	$1 35.10	$1 52.55	76.00
St. Joseph's Hospital	"	......	......	......	......	......	......	69.71	$1 08.69	89.07	83.46
The Hotel Dieu Hospital	Windsor	......	......	......	......	......	......	$1 65.37	98.40	47.79	51.15
St. Joseph's Hospital	Chatham	......	......	......	......	......	......	......	48.56	75.44	71.05
General Hospital	Stratford	......	......	......	......	......	......	......	92.40	86.96	75.72
Amasa Wood Hospital	St. Thomas	......	......	......	......	......	......	......	......	$1 41 24	$1 06.28
General and Marine Hospital	Owen Sound	......	......	......	......	......	......	......	......	$5 09 10	93.28
Sick Children's Hospital	Ottawa	......	......	......	......	......	......	......	......	......	$1 55.96
General Hospital	Chatham	......	......	......	......	......	......	......	......	......	52.73
Total 1894	......	......	......	......	......	......	......	......	......	......	75.33
Total 1893	......	......	......	......	......	......	......	......	......	......	84.55

TABLE X.—Showing proportion of maintenance of Hospitals paid by Government.

Name of Hospitals.	Location.	Revenue on maintenance account exclusive of government grant.	Government grant in aid of maintenance.	Total revenue for maintenance.	Total expenditure for maintenance.	Percentage of government grant to total expenditure for maintenance.
		$ c.	$ c.	$ c.	$ c.	cents.
General Hospital	Toronto	57,148 76	23,784 04	80,932 80	69,555 87	34.19
Homœophatic Hospital	"	13,882 87	4,041 93	17,927 80	12,875 62	31.41
Hospital for Sick Children	"	26,796 85	11,827 70	38,624 55	21,463 23	55.10
St. Michael's Hospital	"	10,326 21	6,209 17	16,535 38	13,716 29	45.27
City Hospital	Hamilton	25,799 68	5,494 72	31,294 40	22,411 91	24.51
St. Joseph's Hospital	"	11,206 35	2,052 80	13,259 15	4,731 99	43.37
General Hospital	Kingston	23,150 52	5,487 49	28,638 01	17,504 15	31.34
Hotel Dieu Hospital	"	8,669 65	5,054 70	13,724 35	12,067 80	41.88
General Protestant Hospital	Ottawa	9,681 29	4,514 60	14,195 89	14,239 19	31.70
Roman Catholic Hospital	"	6,707 47	5,285 62	11,993 09	12,395 28	42.63
House of Mercy Lying-in Hospital	"	6,555 82	2,314 75	8,870 57	7,137 84	32.42
General Hospital	London	13,143 87	5,138 60	18,282 47	17,860 97	28 76
St. Joseph's Hospital	"	3,657 82	720 80	4,378 62	4,371 67	16.47
General and Marine Hospital	St. Catharines	3,954 74	2,349 51	6,304 25	5,788 24	40.58
Galt Hospital	Galt	4,411 43	1,226 40	5,637 83	4,408 60	27.81
General Hospital	Guelph	10,725 55	3,025 45	13,751 00	9,785 79	30.91
St. Joseph's Hospital	"	2,424 95	1,980 61	4,405 56	4,797 50	41.27
General Hospital	Pembroke	3,045 21	1,622 60	4,667 81	4,626 22	35.06
General Hospital	Mattawa	3,125 31	1,462 70	4,588 01	4,128 19	35.41
J. H. Stratford Hospital	Brantford	3,927 37	1,984 52	5,911 89	6,200 18	32.00
St. Joseph's Hospital	Port Arthur	1,314 00	1,134 89	2,448 89	2,808 61	40.38
Belleville Hospital	Belleville	4,705 37	1,535 53	6,241 00	6,066 19	25.30
St. Vincent De Paul Hospital	Brockville	2,079 00	806 76	2,885 76	2,791 53	28.87
General Hospital	"	4,591 31	1,537 55	6,128 86	5,757 34	26.69
General and Marine Hospital	Collingwood	1,393 01	392 62	1,785 63	1,697 95	23.10
Nichol's Hospital	Peterborough	9,257 38	851 00	10,108 38	7,625 16	11.16
St. Joseph's Hospital	"	1,535 83	882 12	2,417 95	2,408 00	36.62
The Hotel Dieu Hospital	Windsor	4,958 94	1,818 26	6,777 20	3,152 97	57.67
St. Joseph's Hospital	Chatham	1,779 54	1,193 04	2,772 58	2,754 04	43.31
General Hospital	Stratford	5,410 60	1,223 40	6,634 00	5,289 17	23.12
Amasa Wood Hospital	St. Thomas	3,146 20	329 93	3,476 13	2,963 20	11.10
General and Marine Hospital	Owen Sound	1,736 25	78 00	1,814 25	1,771 51	4.40
Sick Children's Hospital	Ottawa	3,100 40	....	3,100 40	3,520 11	....
General Hospital	Chatham	3,080 23	....	3,080 23	2,801 13	....
Total 1894	....	296,429 78	107,364 81	403,594 69	321,473 44	33.39
Total 1893	....	270,356 23	101,939 37	373,295 60	297,660 22	36.73

SEPARATE REPORTS AND INSPECTIONS.

GENERAL HOSPITAL, TORONTO.

The following summaries show the operations of this Hospital during the official year:

Movements of Patients.

Number under treatment in all departments of the Hospital, 1st October, 1893	236	
Admitted	2,302	
Births in the Hospital	128	
Total number under treatment		2,666
Discharges, including infants	2,241	
Died	183	
Under treatment, 30th September, 1894	242	
		2,666

Of the 2,666 patients treated during the year, 168 males and 92 females were inmates of the Andrew Mercer Eye and Ear Infirmary, and 288 in the Burnside Lying-in branch. The latter number includes 72 male and 216 female children born in the Institution.

Places Received From

From the City of Toronto (including 128 infants born)	1,958	
From the County of York	94	
From other counties in the Province	593	
From United States	15	
From other countries, including immigrants	6	
		2,666

Sex.

Male	1,530	
Female	1,136	
		2,666

Nationalities.

Canadian	1,368	
English	665	
Irish	316	
Scotch	147	
United States	92	
Other countries	78	
		2,666

The following table gives a summary of certain diseases treated in the Toronto General Hospital during the year:

	No. of cases treated.
Typhoid Fever	130
Typhus	....
Puerperal	......
Cerebro Spinal Fever	....
Diphtheria	5
Smallpox	....

Religious Denominations.

Protestant	2,295	
Roman Catholic	334	
Other religions, or not known	37	
	——	2,666

Revenue.

From the Province of Ontario	$23,784 04
From the City of Toronto, in payment of patients' maintenance	16,356 80
From the County of York, in payment of patients' maintenance	470 40
From other municipalities of the Province	840 05
From paying patients themselves	15,992 86
Income from property belonging to Hospital Trust	18,350 38
Subscriptions, donations and bequests of private individuals	1,195 27
From all other sources not above enumerated	3,943 00
Total	$80,932 80

Expenditures.

Butchers' meat	$9,947 13
Butter	2,531 22
Eggs	1,104 39
Flour, bread and meal	2,279 50
Milk	3,777 62
Tea and coffee	1,226 20
Potatoes and other vegetables	2,280 94
Groceries and provisions, not enumerated	2,605 93
Drugs and medicines	4,066 12
Medical and surgical appliances, bandages, etc	2,754 69
Surgical instruments, ordinary	464 98
Beer, wine and spirits	652 83
Bedding, napery and general house furnishing	2,770 18
Brooms, brushes, mops, soap and cleaning appliances	706 40
Fuel	6,147 79
Light—gas, oil and candles	1,884 08
Water supply	439 00
Hay and straw	66 34

Clothing for employees and patients, including boots and shoes	8 00
Nurses' uniforms, badges, etc	577 90
Ice supply	505 91
Salaries and wages	17,421 85
Insurance	842 33
Coffins and funerals	......
Advertising and printing	80 25
Contingencies	102 79
Repairs, ordinary	4,035 87
Telephone and elevator service	275 63
Legal costs	......
Total	$69,555 87

Government Grant for 1894.

Allowance for Hospital cases, 78,652 days at 20 cents	$15,730 40
Supplementary allowance, at 10 cents	7,865 20
Allowance for improper cases for Hospital treatment, 2,689 days at 7 cents	188 23
Total	$23,783 83

Inspections.

I made an inspection of the General Hospital, Toronto, on the 14th July, and found therein a total population of 227 patients, distributed as follows:

One hundred and eleven males and 52 females in the general wards; 19 males and 4 females in the eye and ear department; 16 adult females and 6 infants in the lying-in branch; and 19 women in the pavilion.

These have been admitted to the Hospital since the 1st of October, and 36 deaths have occurred.

Since the first of the year 10,202 outdoor patients have been treated.

Several improvements have been made in the different departments since my last visit.

The eye and ear department has been repaired and repainted. Private rooms have been refitted and hardwood floors placed in them. The plumbing has been renewed with modern fittings.

New wire mattresses have been provided for the beds of the whole Hospital. Separate laboratories have been arranged for the more convenient and correct examinations of contagious diseases. New batteries have been placed in the electrical department.

The boilers for heating the building are now under the inspection of the Boiler Insurance Company.

A new sterilizer has been put in for disinfecting dressings, etc.

Every part of the Institution was found to be in a clean and orderly condition, and the grounds have been much improved.

The trustees visiting book, showed that continued interest was being taken in the Hospital management by the Board, under the chairmanship of Mr. Walter S. Lee. The records were all written up to date

I made a second inspection of the General Hospital, Toronto, on the 16th November.

On that day there were 228 (127 males and 101 females) persons in residence, as compared with 237 at this time last year.

They were distributed as follows :

In the Burnside lying-in Hospital	14	
" eye and ear infirmary	22	
" pavilion	14	
" general wards	178	
		228

The public wards, officers' departments and nurses' quarters were all in good order.

I examined carefully the food supplies and found them to be of the best quality.

Various improvements have been made in the Institution since the date of my last visit, such as enlarging windows, laying hardwood floors in many of the rooms, and renewing the plumbing in bath-rooms and water-closets. The roof of the main building is being altered to afford accommodation for 26 more patients ; this ward will be for consumptive cases and will be well adapted for that purpose.

Two chemical laboratories have been fitted up for analyzing sputa and urine.

The dining-room, dispensary, wash-rooms, bath-rooms, water-closets, etc, were in a well kept condition.

The grounds have been considerably improved as well as the outbuildings.

The number of outdoor patients treated during the year was larger than usual.

The Hospital is well provided with nurses and medical attendants, and the management, under Dr. Charles O'Reilly and his assistants, is satisfactory in every respect.

HOMŒOPATHIC HOSPITAL, TORONTO.

The following summaries show the operations of this Hospital during the official year:

Movements of Patients.

Number under treatment in the Hospital 1st October, 1893	34	
Admitted	481	
Births in the Hospital	55	
Total number under treatment		570
Discharges, including infants	487	
Died	28	
Under treatment 30th September, 1894	55	
		570

Places Received From.

From City of Toronto	475	
From the County of York	15	
From other counties of the Province	75	
From United States	5	
From other counties, including immigrants	....	
		570

Sex.

Male	2[illegible]	
Female	332	
		570

Nationalities.

Canadian	289	
English	170	
Irish	44	
Scotch	38	
United States	18	
Other countries	11	
		570

Religious Denominations.

Protestant	481	
Roman Catholic	89	
Other religions, or not known	...	
		570

The following table gives a summary of certain cases treated in the Homœopathic Hospital, Toronto, during the year:

	No. of cases treated
Typhoid Fever	29
Typhus "	....
Puerperal "	....
Cerebro spinal fever	....
Diphtheria	....
Smallpox	....

Revenue.

From the Government of Ontario	$ 4,044 93
From the City of Toronto, in payment of patients' maintenance	3,797 00
From paying patients themselves	5,496 79
Income from endowments or other property of the Hospital	455 00
Subscriptions, donations and bequests of private individuals	1,330 03
From all other sources not above enumerated	2,804 05
Total	$17,927 80

Expenditures.

Butchers' meat	950 53
Butter	347 86
Eggs	......
Flour, bread and meal	317 22
Milk	224 84
Tea and coffee	56 10
Potatoes and other vegetables	257 57
Groceries and provisions not enumerated	565 07
Drugs and medicines	226 21
Medical and surgical appliances	238 33
Surgical instruments	80 93
Beer, wine and spirits	107 02
Bedding, napery and general house furnishing	1,691 09
Brooms, brushes, mops, soap and cleaning appliances	77 74
Fuel	1,341 48
Light—gas, oil and candles	840 94
Water supply	116 20
Hay and straw	2 50
Clothing for patients, including boots and shoes	....
Ice	41 08
Salaries and wages	4,035 38
Taxes and insurance	664 84
Contingencies	498 60
Repairs, ordinary	194 09
Advertising, stationery, etc.	......
Coffins and funerals	......
Rent	....
Total	$12,875 62

NOTE.—Extraordinary repairs and interests — 5,332 60

Government Grant for 1894.

Allowance for Hospital cases, 14,232 days, at 20 cents	$ 2,846 40
Supplementary allowance, at 10 cents	1,423 20
Allowance for improper cases for Hospital treatment, 797 days, at 7 cents	55 79
Total	$ 4,325 39

I inspected the Homœopathic Hospital, Toronto, on the 9th March, and found 68 patients under treatment, namely, 15 men, 46 women and 7 infants.

Received since the first of the year, 316 ; died, 12.

The private rooms and public wards were clean and in good order The kitchen, laundry, dining-room, pantries, dispensary, operating-room, sitting-room, bath-rooms, and water-closets were all in a well kept condition.

A new elevator has been put in for moving patients from one flat to another.

The maternity department, in adjoining building, is well managed.

There is a good staff of medical attendants and nurses.

I made an inspection of this Hospital on the 17th November. There were 57 patients in residence, 12 males and 45 females. Four of the latter were in the maternity department.

The number of patients under treatment during the year was 533, and the deaths, 28. A large, airy ward has been fitted up on the first flat as a medical ward, which is very convenient and suitable for the treatment of patients.

All the private rooms and public wards were in a clean and well kept condition. The dining-room, kitchen, etc., were also in good order. The books were well kept.

HOSPITAL FOR SICK CHILDREN, TORONTO.

The following summaries show the operations of this Institution during the year:

Movements of Inmates.

Under treatment, 1st October, 1893	91	
Admitted	437	
Total number of inmates	——	528
Discharged	431	
Died	19	
Under treatment, 30th September, 1894	78	
	——	528

Places Received From.

From the City of Toronto	459	
From the County of York	23	
From other counties of the Province	45	
From United States	1	
From other countries, including immigrants	....	
	——	528

Sex.

Male	284	
Female	244	
	——	528

Nationalities.

Canadian	505	
English	11	
Irish	6	
Scotch	2	
United States	3	
Other countries	1	
	——	528

Religious Denominations.

Protestant	460	
Roman Catholic	62	
Other religions	6	
	——	528

The following table gives a summary of certain diseases treated in the Hospital during the year:

	No. of cases treated.
Typhoid fever	23
Typhus fever	....
Puerperal fever	....
Cerebro spinal fever	....
Diphtheria	5
Smallpox	....

Revenue.

From the Province of Ontario	$11,827 70
From the Dominion Government	....
From the County of York	....
From other municipalities	94 80
From the City of Toronto	5,000 00
From patients themselves, for maintenance and treatment	1,340 83
From property belonging to the Hospital	69 00
From subscriptions, donations and bequests from private individuals	20,122 22
From all other sources not enumerated	170 00
Total	$38,624 55

Expenditures.

Butchers' meat	$1,388 94
Butter	607 12
Eggs	270 31
Flour, bread and meal	668 20
Milk	1,260 67
Tea and coffee	270 21
Potatoes and other vegetables	253 77
Groceries and provisions not enumerated	1,073 60
Drugs and medicines	699 07
Medical and surgical appliances	1,256 74
Surgical instruments	91 11
Beer, wine and spirits	74 19
Bedding, napery and general house-furnishings	1,256 76
Brooms, brushes, mops, soap and cleaning appliances	707 75
Fuel	2,663 33
Light—gas, oil and candles	488 30
Water supply	284 44
Hay and straw	......
Clothing for patients, including boots and shoes	710 29
Ice	104 80
Salaries and wages	5,015 33
Insurance and taxes	755 04
Contingencies	585 49

Repairs, ordinary	$606 04
Advertising, stationery, etc.	371 73
Coffins and funerals	......
Total	$21,463 23
NOTE.—Extraordinary repairs and interest	8,473 13

Government Grant for 1894.

Allowance for Hospital cases, 25,903 days, at 20 cents per day	$5,180 60
Supplementary allowance, at 10 cents	2,590 30
Allowance for improper cases for Hospital treatment, 2,249 days, at 7 cents per day	157 43
Total	$7,928 33

I beg to state that I made an official inspection of the Hospital for Sick Children, Toronto, on the 5th March.

There were in the Hospital on that day 82 children; 40 males and 42 females.

The admissions since the 1st October were 261, and deaths 9.

I found every part of the building beautifully clean and well kept. It is not surpassed in the Province for its conveniences and sanitary provisions It is well supplied with nurses, and there is a good medical staff in attendance. There is no change to report since my last visit. The books are well kept.

I inspected this Hospital on the 16th November.

The register showed that there were 96 children under treatment, viz.: 52 males and 44 females. There had been received during the year 437, and the deaths during the same period numbered 22.

I found no change in the building or grounds since my last inspection. All the public wards and private rooms were in their usual excellent condition of cleanliness and order. Two or three rooms have been fitted up for use as suspect rooms in cases where there is any fear of contagious disease. There is a good medical and nursing staff.

I visited the Convalescent Home on the Island, on the 15th July. This Home was provided by Mr. John Ross Robertson, of *The Evening Telegram*, to afford the little patients in the Hospital for sick children some relief from the heat and confinement of the city institution, and give them plenty of fresh air.

All the wards were clean and tidy. The bath rooms, water-closets, wash-rooms, etc., were all also in a well kept condition.

There is a resident medical officer and a good supply of nurses.

ST. MICHAEL'S HOSPITAL, TORONTO.

The following summaries show the operations of this Hospital during the official year:

Movements of Patients.

Number under treatment in the Hospital 1st August, 1893	51	
Admitted - - - - - - -	711	
Births in the Hospital - - - - - -	3	
Total number under treatment - - -	——	765
Discharges, including infants - - - - -	665	
Died - - - - - - - -	50	
Under treatment 30th September, 1894 - - -	50	
	——	765

Places Received From.

From the City of Toronto - - - - - -	660	
From the County of York - - - - -	29	
From other counties of the Province - - -	66	
From United States - - - - - -	8	
From other countries, including immigrants - -	2	
	——	765

Sex.

Male - - - - - - - -	390	
Female - - - - - - -	375	
	——	765

Nationalities.

Canadian - - - - - - - -	391	
English - - - - - - -	85	
Irish - - - - - - - -	218	
Scotch - - - - - - -	16	
United States - - - - - - -	39	
Other countries - - - - - -	16	
	——	765

Religious Denominations.

Protestant - - - - - - - -	201	
Roman Catholic - - - - - -	561	
Other religions, or not known - - - - -	3	
	——	765

The following table gives a summary of certain cases treated in St. Michael's Hospital, Toronto, during the year:

	No. of cases treated.
Typhoid fever	53
Typhus	..
Puerperal	..
Cerebro spinal fever	..
Diphtheria	..
Smallpox	..

Revenue.

From the Government of Ontario	$6,209	17
From the City of Toronto, in payment of patients' maintenance	3,464	80
From paying patients themselves	3,752	92
Subscriptions, donations and bequests of private individuals	654	16
From all other sources not above enumerated	2,454	33
Total	$16,535	38

Expenditures.

Butchers' meat	$1,344	21
Butter	1,185	02
Flour, bread and meal	463	10
Milk	1,178	46
Tea and coffee	138	04
Potatoes and other vegetables	283	61
Groceries and provisions not enumerated	614	29
Drugs and medicines	982	14
Medical and surgical appliances	263	92
Surgical instruments	45	93
Beer, wine and spirits	202	02
Bedding, napery and general house furnishing	657	07
Brooms, brushes, mops, soap and cleaning appliances	225	73
Fuel	740	84
Light—gas, oil and candles	309	87
Water supply	135	78
Hay and straw	......	
Clothing for patients, including boots and shoes	36	72
Ice	104	30
Salaries and wages	1,269	24
Taxes and insurance	91	00
Contingencies	824	23
Repairs, ordinary	1,554	30
Telephone service	47	00
Coffins and funerals	......	
Interest	1,019	47
Total	$13,716	29

Government Grant for 1894.

Allowances for Hospital cases, 19,634 days at 20 cents	$3,926 80
Supplementary allowance, at 10 cents - -	1,963 40
Allowance for improper cases for Hospital treatment, 982 days at 7 cents - - - -	68 74
Total - - - - -	$5,958 94

INSPECTIONS.

I made an inspection of the St. Michael's Hospital, Toronto, on the 4th of April, when there were 50 patients, viz.: 22 men, 25 women and 3 children. During the year the admissions have been 356, and the deaths 29.

I found all the departments, public wards, private rooms, etc., in a cleanly and orderly condition. The drainage and ventilation are also satisfactory.

The Hospital is well supplied with nurses, and there is a large medical staff.

This Hospital was again inspected by me on the 17th November. The patients on that date numbered 52—26 men, 21 women and 5 children.

Seven hundred and eleven patients were treated during the year, and 50 died.

A new wing, three stories high, has been built on the south side of the main building. This will afford accommodation for about 60 more patients.

The Hospital was in good order. There is a competent staff of nurses and medical attendants. The books were properly entered up.

CITY HOSPITAL, HAMILTON.

The following summaries show the operations of this Hospital during the official year:

Movements of Patients.

Number under treatment, 1st October, 1893	53	
Admitted	763	
Births in the Hospital	28	
Total number under treatment		844
Discharged	691	
Died	81	
Under treatment, 30th September, 1894	72	
		844

Places Received From.

From the City of Hamilton, including births in Hospitals	799	
From the County of Wentworth	13	
From other counties in the Province	24	
From United States	3	
From other countries	5	
		844

Sex.

Male	490	
Female	354	
		844

Nationalities.

Canadian	426	
English	209	
Irish	92	
Scotch	60	
United States	33	
Other countries	24	
		844

Religious Denominations.

Protestant	690	
Roman Catholic	145	
Other religions	9	
		844

The following table gives a summary of certain diseases treated in the City Hospital, Hamilton, during the year:

	Number of cases treated.
Typhoid fever	33
Typhus fever	..
Puerperal fever	1
Cerebro spinal fever	..
Diphtheria	68
Smallpox	2

Revenue.

From the Province of Ontario	$ 5,494 72
From the City of Hamilton	23,257 71
From the County of Wentworth	2,541 97
From paying patients themselves	....
Total	$31,294 40

Expenditures.

Butchers' meat	$ 2,508 32
Butter	935 02
Flour, bread and meal	595 74
Milk	858 17
Tea and coffee	270 26
Potatoes and other vegetables	614 22
Groceries and other provisions not enumerated	1,625 74
Drugs and medicines	1,346 58
Surgical instruments and appliances	205 46
Beer, wine and spirits	173 10
Bedding, etc.	1,203 89
Brooms, brushes, mops, soap and cleansing appliances	274 95
Fuel	2,054 51
Light—gas, oil and candles	818 33
Water supply	300 00
Hay and straw	23 76
Clothing for patients, including boots and shoes	56 80
Ice	234 90
Salaries and wages	6,377 95
Taxes and insurance	700 00
Coffins and funerals	......
Contingencies	872 44
Repairs, ordinary	361 77
Total	$22,411 91

Note.—Extraordinary repairs, Fever Hospital, etc. 3,387 77

Government Grant for 1894.

Allowance for Hospital cases, 22,436 days at 20 cents	$4,487 20
Supplementary allowance at 10 cents - -	2,243 60
Allowance for improper cases for Hospital treatment, 2,207 days at 7 cents - - - -	154 49
Total - - - - - - - -	$6,885 29

INSPECTIONS.

I made an inspection of the City Hospital, Hamilton, on the 2nd March. There were 44 males, 37 females, and 9 children under treatment on that day.

Since the 1st October the admissions were 317, and the deaths 27.

All the public wards and private rooms were clean and in good condition. The dispensary, operating-room, dining-room, bath-rooms and water-closets were also in good order.

There is a separate brick building on the premises used as a lying-in-hospital, in which there were a number of cases at the time of my visit. There is also a frame building in the vicinity for the isolation of infectious cases There is a good staff of medical men and nurses.

The books are well kept.

I understand that there is some dissatisfaction or difficulty between the medical staff and the board of management, which I hope will soon be amicably settled.

There are a number of cases in the Hospital who should be cared for in a home for old people, or a home for incurables.

I inspected this Hospital again on the 24th October, and found therein 72 patients; 39 males, 26 females and 7 children.

The number under treatment during the year was 845, and the deaths 81. There were 36 lying-in cases during the year.

A new building for contagious diseases has been erected convenient to the Hospital. It is a brick structure, and will accommodate 16 patients. Diphtheria, scarlet fever and measles are treated here. It is well equipped with appliances for sanitary purposes. The old frame building is no longer used. Seventy-five cases of contagious diseases have been treated during the year.

The irregularities as to the medical staff have not yet been remedied. There has been some improvement in the nursing staff.

All the departments were clean and in good order, and the books properly kept.

There are still a number of patients in the Hospital who should properly be cared for in a home for old people. And there are other cases who have been allowed a longer stay than is necessary, at least the books would seem to indicate this.

ST. JOSEPH'S HOSPITAL, HAMILTON.

The following summaries show the operations of this Hospital during the official year:

Movements of Patients

Number under treatment, 1st October, 1893	19	
Admitted	252	
Total number under treatment		271
Discharged	227	
Died	16	
Under treatment, 30th September, 1894	28	
		271

Places Admitted From.

From the City of Hamilton	249	
From the County of Wentworth	14	
From other counties in the Province	8	
From the United States	....	
From other countries	....	
		271

Sex.

Male	124	
Female	147	
		271

Nationalities.

Canadian	147	
English	65	
Irish	43	
Scotch	7	
United States	1	
Other countries	8	
		271

Religious Denominations.

Protestant	126	
Roman Catholic	145	
Other religions	....	
		271

The following table gives a summary of certain diseases treated in St. Joseph's Hospital, Hamilton, during the year:

	No. of cases treated
Typhoid fever	20
Typhus fever	....
Puerperal fever	....
Cerebro spinal fever	....
Diphtheria	....
Smallpox	...

Revenue.

From the Province of Ontario	$2,052 80
From the City of Hamilton	....
From other municipalities in the Province	....
From paying patients themselves	1,990 50
Subscriptions, donations and bequests in cash	8,549 75
Income from endowments, etc., or other property belonging to the Hospital	640 00
Received from other sources	26 10
Total	$13,259 15

Expenditures.

Butchers' meat	$714 80
Butter	174 45
Flour, bread and meal	209 58
Milk	102 51
Tea and coffee	109 56
Potatoes and other vegetables	125 44
Groceries and other provisions not enumerated	504 23
Drugs and medicines	222 12
Surgical appliances	69 04
Beer, wine and spirits	106 51
Bedding, etc.	266 47
Brooms, brushes, mops, soap and cleaning appliances	25 49
Fuel	365 87
Light—gas, oil and candles	146 27
Water supply	64 20
Hay and straw	39 49
Clothing for patients, including boots and shoes	83 52
Ice	11 65
Salaries and wages	493 81
Taxes, insurance and interest	598 25
Coffins and funerals	......
Contingencies	240 07
Repairs, ordinary	58 66
Total	$4,731 99
NOTE.—Extraordinary repairs and additions	8,976 30

Government Grant for 1894.

Allowance for Hospital cases, 7,166 days at 20 cents -	$1,433 20
Supplementary allowance at 10 cents - -	716 60
Allowance for improper cases for Hospital treatment, 492 days at 7 cents - - - -	34 44
Total - - - - -	$2,184 24

The St. Joseph's Hospital, Hamilton, was inspected by me on the 3rd March There were 23 patients in residence—10 men, 12 women, and 1 child. Since the 1st October the admissions numbered 114, and the deaths 7.

All the different departments were clean and in good order.

There was no change to note in the building or premises since my last visit.

More than half of the patients received at this Hospital during the year were of Protestant denominations.

There is a good staff of medical men and nurses. The books are well kept.

I made an inspection of the St. Joseph's Hospital, Hamilton, on the 26th October. On the books of the Hospital were the names of 23 persons (10 men and 13 women) who were under treatment.

The public wards and private rooms were clean and in good order.

A large wing is being added to the Institution, to afford increased accommodation for patients. A new elevator has been placed in the building lately, and other improvements made.

There is a good staff of medical men and nurses. The books were found to be properly kept.

GENERAL HOSPITAL, KINGSTON.

The following summaries show the operations of this Hospital during the official year:

Movements of Patients.

Number under treatment 1st October, 1893	73	
Admitted	748	
Births in Hospital	40	
Total number under treatment		861
Discharged	754	
Died	37	
Under treatment, 30th September, 1894	70	
		861

Places Received From.

From the City of Kingston (including births)	527	
From the County of Frontenac	155	
From other counties of the Province	161	
From the United States	12	
From other countries	6	
		861

Sex.

Male	388	
Female	473	
		861

Religious Denominations.

Protestant	770	
Roman Catholic	88	
Other religions (or not known)	3	
		861

Nationalities.

Canadian	649	
English	103	
Irish	53	
Scotch	31	
United States	17	
Other countries	8	
		861

The following table gives a summary of certain diseases treated in the General Hospital, Kingston, during the year:

	No. of cases treated.
Typhoid fever	26
Typhus fever	..
Puerperal fever	1
Cerebro spinal fever	..
Diphtheria	6
Smallpox	1

Revenue.

From the Province of Ontario	$ 5,487 49
From the Dominion Government	500 00
From the County of Frontenac	300 00
From the City of Kingston	750 00
From other municipalities of the Province	195 00
From patients themselves for treatment	3,689 08
Income from endowment and other property of Hospital	220 60
Subscriptions, donations and bequests	15,733 62
From all other sources not enumerated	1,762 22
Total	$28,638 01

Expenditures.

Butchers' meat	$ 1,032 36
Butter	634 49
Flour, bread and meal	409 74
Milk	658 61
Tea and coffee	230 14
Potatoes and other vegetables	224 53
Groceries and provisions, not enumerated	1,479 26
Drugs and medicines	638 64
Surgical instruments and appliances	520 69
Beer, wine and spirits	130 42
Bedding, napery and general house furnishings	2,093 51
Brooms, brushes, mops, soap and cleaning appliances	245 66
Fuel	1,633 25
Light—gas, oil and candles	446 79
Water supply	155 50
Straw	......
Clothing for patients	67 00
Ice	30 00
Salaries and wages	3,883 06
Insurance	191 00
Coffins and funerals	6 50
Contingencies	984 63
Repairs, ordinary	1,808 37
Total	$17,504 15

NOTE.—Extraordinary repairs, chiefly new buildings $14,145 91

Government Grant for 1894.

Allowances for Hospital cases, 16,750 days, at 20 cents per day - - - - -	$ 3,350 00
Supplementary allowance, at 10 cents per day -	1,675 00
Allowance for improper cases for Hospital treatment, 3,665 days, at 7 cents - - - -	256 55
Total - - - - -	$ 5,281 55

INSPECTIONS.

I made an inspection of the General Hospital, Kingston, on the 22nd February. There were under treatment as patients, on that day, 33 males and 38 females.

Since the 1st October the admissions were 234, and the deaths 13.

The public wards, private rooms, dining-room, dispensary and operating-room, reception-room, bath-rooms, and water-closets were all clean and in good order. The laundry and morgue are outside the Hospital building and convenient to it.

A new maternity hospital has been erected on the premises, and is nearly completed.

There is a good staff of medical men and nurses. The books are well kept.

I made a second inspection of this Hospital for the current year, on the 26th December, when there were 64 patients in residence, 25 men, 29 women and 10 children.

The building was in good order throughout. The new maternity hospital is completed and in every way fitted for maternity work.

HOTEL DIEU HOSPITAL, KINGSTON.

The following summaries show the operations of this Hospital during the official year:

Movements of Patients.

Number under treatment, 1st October, 1893	40	
Admitted	587	
Total number under treatment		627
Discharged	564	
Died	24	
Under treatment, 30th September, 1894	39	
		627

Places Received From

From the City of Kingston	350	
From the County of Frontenac	155	
From other counties of the Province	85	
From United States	28	
From other countries	9	
		627

Sex.

Male	255	
Female	372	
		627

Nationalities.

Canadian	492	
English	20	
Irish	68	
Scotch	10	
United States	28	
Other countries	9	
		627

Religious Denominations.

Protestant	115	
Roman Catholic	512	
		627

The following table gives a summary of certain diseases treated in the Hotel Dieu Hospital, Kingston, during the year:

	No. of cases treated.
Typhoid fever	25
Typhus fever	....
Puerperal fever	....
Cerebro spinal fever	....
Diphtheria	3
Smallpox	....

Revenue.

From the Province of Ontario	$5,054	70
From the City of Kingston	....	
From municipalities	162	50
From patients themselves, for maintenance and treatment	2,151	81
Income from investments	322	50
Subscriptions, donations and bequests	5,152	75
From other sources not enumerated	880	09
Total	$13,724	35

Expenditures.

Butchers' meat	$1,384	24
Butter	629	92
Flour, bread and meal	763	25
Milk	484	36
Tea and coffee	300	00
Potatoes and other vegetables	229	52
Groceries and provisions not enumerated	1,177	76
Drugs and medicines	503	05
Medical and surgical appliances Surgical instruments	143	01
Beer, wine and spirits	161	55
Bedding, napery and general house furnishings Brooms, brushes, mops, soap and cleaning appliances	738	09
Fuel	716	50
Light—gas, oil and candles	257	48
Water supply	125	26
Hay and straw	98	45
Clothing for patients including boots and shoes	837	34
Ice	14	00
Salaries and wages	404	52
Taxes and insurance	571	00
Coffins and funerals	10	50
Contingencies	518	00
Repairs, ordinary	2,000	00
Postage, telegraphing, telephone, express, stationery, etc	....	
Total	$12,067	80

Government Grant for 1894.

Allowance for Hospital cases, 18,592 days, at 20 cents per day - - - - -	3,718 40
Supplementary allowance, at 10 cents - -	1,859 20
Allowance for improper cases for Hospital treatment, 386 days, at 7 cents - - - -	27 02
Total - - - - -	$5,604 62

INSPECTIONS.

I made an inspection of the Hotel Dieu Hospital, Kingston, on the 22nd February. On that date there were 53 patients—25 men and 28 women. Since the 1st of October 220 have been received, and 6 have died.

The Hospital in all its departments was in a commendable state of cleanliness and order. There is good drainage and ventilation, and the plumbing is in good order.

There is an elevator in the building, and water-closets and bath-rooms on the different flats. The nursing and medical attendance are well provided for.

I again visited this hospital on the 26th December. The patients then in residence numbered 58—27 men, 30 women and 1 child.

All the private and public wards were in good order as well as all other parts of the Institution.

The new wing for the orphanage department and chapel, is nearly completed. The books are properly kept.

GENERAL PROTESTANT HOSPITAL, OTTAWA.

The following summaries show the operations of this Hospital during the official year:

Movements of Patients.

Number under treatment, 1st October, 1893	42	
Admitted	510	
Births in the Hospital	..	
Total number under treatment	—	552
Discharged	450	
Died	40	
Under treatment, 30th September, 1894	62	
	—	552

Places Admitted From.

From the City of Ottawa	370	
From the County of Carleton	26	
From other counties in the Province	102	
Other countries	54	
	—	552

Sex.

Male	299	
Female	253	
	—	552

Nationalities.

Canadian	342	
English	107	
Irish	48	
Scotch	24	
United States	8	
Other countries	23	
	—	552

Religious Denominations.

Protestant	471	
Roman Catholic	42	
Other religions, or not known	39	
	—	552

The following table gives a summary of certain diseases treated in the General Protestant Hospital, Ottawa, during the year:

	No. of cases treated.
Typhoid fever	36
Typhus "	..
Puerperal "	..
Cerebro spinal fever	..
Diphtheria	49
Smallpox	..

Revenue.

From the Province of Ontario - - -	$4,514 60
From the City of Ottawa - - -	1,245 10
From the County of Carleton - - -	200 00
From other municipalities - - -	235 00
From patients themselves for maintenance and treatment	2,116 79
Income and endowments - - - - -	575 25
Subscriptions, donations and bequests of private individuals - - - - -	3,224 75
From other sources not enumerated - - -	2,084 40
Total - - - - - -	$14,195 89

Expenditures.

Butchers' meat - - - - -	$839 53
Butter - - - - - -	663 18
Flour, bread and meal - - - -	446 72
Milk - - - - - -	780 25
Tea and coffee - - - - -	109 32
Potatoes and other vegetables - - -	76 90
Groceries and provisions not enumerated - -	490 53
Drugs and medicines; Medical and surgical appliances; Surgical instruments - -	1,652 36
Beer, wine and spirits - - - -	112 53
Bedding, napery and general house furnishings -	691 63
Brooms, brushes, mops, soap and cleaning appliances -	6 00
Fuel - - - - - -	1,110 43
Light—gas, oil and candles - - - -	236 72
Water supply - - - - -	38 17
Hay and straw - - - - -	15 00
Clothing for patients, including boots and shoes -	....
Ice - - - - - -	32 70
Salaries and wages - - - -	5,608 80
Taxes and insurance - - - - -	156 10
Coffins and funerals - - - -	77 00
Contingencies - - - - -	665 09
Repairs, ordinary - - - - -	271 10
Postage, telegraphing, telephone, express, stationery, etc - - - - - -	159 13
Total - - - - -	$14,239 19

Government Grant for 1894.

Allowance for Hospital cases, 16,215 days, at 20 cents per day - - - - -	$3,243 00
Supplementary allowance, at 10 cents - -	1,621 50
Allowance for improper cases for Hospital treatment, 5,656 days, at 7 cents - - - - -	395 92
Total - - - - - -	$5,260 42

Inspections.

An inspection of the General Protestant Hospital, Ottawa, was made by me on the 7th February. There were 73 patients in residence—42 males and 31 females—and there had been received since the 1st October, 191, and 13 had died.

The whole building has been painted lately, inside and out, much improving its appearance.

It is heated with hot water, supplied with city water, and lighted with gas.

All departments were clean and in good order, from basement to attic. The laundry and washrooms are outside the main building.

More accommodation could be provided by building a wing to the present building. There are good nurses and an efficient medical staff.

I made an inspection of the General Hospital, Ottawa, on the 10th October. On that day there were 79 patients under treatment. The admissions during the year were 510 and the deaths 45.

The public wards, private rooms, dining-rooms, dispensary, operating-room, etc., were all in an excellent condition of cleanliness and order.

There has been no change in the building or grounds since my last inspection. The books are correctly kept.

ROMAN CATHOLIC HOSPITAL, OTTAWA,

The following summaries show the operations of this Hospital during the official year:

Movements of Patients.

Number under treatment, 1st October, 1893	44	
Admitted	776	
Total number under treatment		820
Discharged	674	
Died	94	
Under treatment, 30th September, 1894	52	
		820

Places Received From.

From the City of Ottawa	696	
From the County of Carleton	68	
From other counties in the Province	34	
From the United States	9	
From other countries	13	
		820

Sex.

Male	390	
Female	430	
		820

Nationalities.

Canadian	646	
English	23	
Irish	113	
Scotch	3	
United States	9	
Other countries	26	
		820

Religious Denominations.

Protestant	13	
Roman Catholic	801	
Other religions	6	
		820

The following table gives a summary of certain diseases treated in the General Roman Catholic Hospital, Ottawa, during the year:

	No. of cases treated.
Typhoid fever	19
Typhus "	..
Puerperal "	4
Cerebro spinal fever	..
Diphtheria	163
Smallpox	..

Revenue.

From the Province of Ontario	$5,285 62
From the City of Ottawa	1,200 00
From the County of Carleton	250 00
From other municipalities	....
From patients themselves for maintenance and treatment	2,187 87
Income from endowments	300 00
Subscriptions, donations and bequests of private individuals	1,031 69
From all other sources not enumerated	1,737 91
Total	$11,993 09

Expenditures.

Butchers' meat	$1,706 23
Butter	744 64
Flour, bread and meal	661 38
Milk	827 54
Tea and coffee	266 12
Potatoes and other vegetables	338 92
Groceries and provisions not enumerated	528 02
Drugs and medicines	783 12
Medical and surgical appliances	....
Surgical instruments	341 69
Beer, wine and spirits	303 88
Bedding, napery and general house furnishings	655 74
Brooms, brushes, mops, soap and cleaning appliances	113 91
Fuel	1,079 80
Light—gas, oil and candles	314 65
Water supply	325 00
Hay and straw	112 51
Clothing for patients, including boots and shoes	....
Ice	58 95
Salaries and wages	1,788 00
Taxes and insurance	353 32
Coffins and funerals	....
Contingencies	277 71
Repairs, ordinary	814 15
Total	$12,395 28

Government Grant for 1894.

Allowance for Hospital cases, 17,405 days at 20 cents	$3,481 00
Supplementary allowance of ¼ of revenue	1,676 86
Allowance for improper Hospital cases, 3,840 days at 7 cents	268 80
Total	$5,426 66

INSPECTIONS.

I inspected the Roman Catholic Hospital, Ottawa, on the 7th February.

There were registered as patients on that day, 25 men and 27 women.

Received since the 1st October, 212 ; died, 17.

The public wards and private rooms were clean and in good order. On the second flat operating rooms have been fitted up for female patients.

There is a good staff of nurses and medical men. The books are well kept.

I made an inspection of the Roman Catholic Hospital, Ottawa, on the 9th October on which occasion there were 39 patients under treatment, 18 men, 20 women and 1 child. There were 776 admissions during the year, and 94 deaths.

There is a department for contagious diseases some distance away from the main building, in which 200 were treated during the year.

All the different departments of the Hospital were in the most satisfactory condition. There is a good dispensary, and new instruments for hospital use have lately been supplied.

HOUSE OF MERCY LYING-IN HOSPITAL, OTTAWA.

The following summaries show the operations of this Hospital during the official year:

Movements of Patients.

Number under treatment, 1st October, 1893	37	
Admitted	178	
Births in Hospital	159	
Total number under treatment	—	374
Discharged	342	
Died	4	
Under treatment, 30th September, 1894	28	
	—	374

Places Received From.

From the City of Ottawa	105	
From the County of Carleton	17	
From other counties in the Province	201	
From the United States	17	
From other countries	34	
	—	374

Sex.

Male	90	
Female	284	
	—	374

Nationalities.

Canadian	127	
English	93	
Irish	101	
Scotch	41	
United States	4	
Other countries	8	
	—	374

Religious Denominations.

Protestant	131	
Roman Catholic	243	
	—	374

Revenue.

From the Province of Ontario	$2,314 75
From the County of Carleton	....
From paying patients themselves	1,026 00
Income from investments	12 05
From subscriptions and donations	3,441 54
From other sources	2,076 23
Total	$8,870 57

Expenditures.

Butchers' meat	$803 32
Butter	437 45
Flour, bread and meal	504 30
Milk	250 37
Tea and coffee	86 81
Potatoes and other vegetables	360 05
Groceries and provisions, not enumerated	583 55
Drugs and medicines	75 69
Medical and surgical appliances	.... ..
Surgical instruments	.... ..
Beer, wine and spirits	51 79
Bedding, napery and general house-furnishings	1,382 01
Brooms, brushes, mops, soap and cleaning appliances	154 30
Fuel	375 85
Light—gas, oil and candles	130 50
Water supply	128 68
Hay and straw	199 79
Clothing for patients, including boots and shoes	137 02
Ice	24 25
Salaries and wages	486 96
Taxes and insurance	11 84
Coffins and funerals	6 45
Contingencies	.... ..
Repairs, ordinary	946 86
Total	$7,137 84

Government Grant for 1894.

Allowance for Hospital cases, 6,259 days at 20 cents	$1,251 80
Supplementary allowance at 10 cents	625 90
Allowance for improper Hospital cases, 5,546 days at 7 cents	388 22
Total	$2,265 92

INSPECTIONS.

I made an inspection of the House of Mercy Lying-in-Hospital, Ottawa, on the 7th February. There were 30 inmates on that day; 55 had been received since the 1st October. Two infants had died in that period, but no adults.

All the rooms were clean and neat. There was a good staff of nurses and medical men in attendance. The books were properly kept.

I inspected this Hospital on the 8th October. The inmates on that day numbered 36. The admissions during the year were 178, and the deaths 2.

The only change to note in the building or premises since my last inspection is the putting in of electric light and a hot water furnace.

The Institution was in satisfactory order throughout, and the books were entered up.

HOSPITAL FOR SICK CHILDREN, OTTAWA.

The following summaries show the operations of this Hospital during the official year:

Movements of Patients.

Number under treatment, 1st October, 1893	6	
Admitted	67	
Births	1	
Total number under treatment		74
Discharged	65	
Died	3	
Under treatment, 30th September, 1894	6	
		74

Places Received From.

From the City of Ottawa	59	
From the County of Renfrew	4	
From other counties in the Province	2	
From the United States	2	
From other countries	7	
		74

Sex.

Male	27	
Female	47	
		74

Nationalities.

Canadian	40	
English	21	
Irish	1	
Scotch	....	
United States	3	
Other countries	9	
		74

Religious Denominations.

Protestant	63	
Roman Catholic	10	
Other religions	1	
		74

The following table gives a summary of certain diseases treated in the Hospital for Sick Children, Ottawa, during the year:

	No. of cases treated.
Typhoid fever	5
Typhus "	....
Puerperal "	....
Cerebro spinal fever	....
Diphtheria	....
Smallpox	...

Revenue.

From the Province of Ontario	$ ......
From the City of Ottawa	......
From the County of Carleton	......
From other municipalities	......
From patients themselves for maintenance and treatment	1,134 40
Income from endowments	......
Subscriptions, donations and bequests of private individuals	955 93
From other sources not enumerated	1,010 07
Total	$3,100 40

Expenditures.

Butchers' meat	$ 277 00
Butter	77 80
Flour, bread and meal	79 06
Milk	156 00
Tea and coffee	33 58
Potatoes and other vegetables	50 41
Groceries and provisions not enumerated	166 46
Drugs and medicines	40 78
Medical and surgical appliances	19 24
Surgical instruments	2 45
Beer, wine and spirits	7 85
Bedding, napery and general house furnishings	38 44
Brooms, brushes, mops, soap and cleaning appliances	14 60
Fuel	208 50
Light—gas, oil and candles	99 62
Water supply	12 00
Hay and straw	......
Clothing for patients, including boots and shoes	......
Ice	8 25
Salaries and wages	1,716 00
Taxes, insurance and interest	340 57
Coffins and funerals	......
Contingencies	95 51
Repairs, ordinary	75 99
Total	$3,520 11

Government Grant for 1894.

Allowance for Hospital cases, 2,257 days at 20 cents per day - - - - -	$451 40
Supplementary allowance, at 10 cents - -	225 70
Total - - - - - -	$677 10

INSPECTIONS.

I beg to report that I visited the Hospital for Sick Children, Ottawa, on the 9th October. On that date there were five children in residence. There were also three adult patients receiving treatment as private patients, for which they pay. During the last year fifty children were received for treatment, and there were three deaths and one birth.

There is a good staff of doctors and nurses. The books are correctly kept.

GENERAL HOSPITAL, LONDON.

The following summaries show the operations of this Hospital during the official year:

Movements of Patients.

Number under treatment, 1st October, 1893 - -	61	
Admitted - - - - - - - -	574	
Births in the Hospital - - - -	19	
Total number under treatment - - -		654
Discharged - - - - - - -	550	
Died - - - - - - - -	52	
Under treatment, 30th September, 1894 - -	52	
		654

Places Received From.

From the City of London - - - -	475	
From the County of Middlesex - - - -	98	
From other counties in the Province - - -	55	
United States and other countries - - -	26	
		654

Sex.

Male - - - - - - - -	336	
Female - - - - - - -	318	
		654

Nationalities.

Canadian	377	
English	141	
Irish	61	
Scotch	36	
United States	19	
Other countries	20	
		654

Religious Denominations.

Protestant	568	
Roman Catholic	71	
Other religions	15	
		654

The following table gives a summary of certain diseases treated in the General Hospital, London, during the year:

	No. of cases treated.
Typhoid fever	20
Typhus fever	....
Puerperal fever	....
Cerebro spinal fever	4
Diphtheria	46
Smallpox	....

Revenue.

From the Province of Ontario	$ 5,138 60
From the City of London	7,107 37
From the County of Middlesex, in payment for patients	2,063 04
From paying patients themselves	3,518 68
From income from property or investments	454 78
Total	$18,282 47

Expenditures.

Butchers' meat	$1,509 00
Butter	629 43
Flour, bread and meal	432 33
Milk	917 89
Tea and coffee	325 41
Potatoes and other vegetables	319 46
Groceries and provisions not enumerated	1,124 29
Drugs and medicines	1,294 01
Surgical instruments	....
Medical and surgical appliances	291 63
Beer, wine and spirits	153 81
Bedding, napery and general house furnishings	1,227 21
Brooms, brushes, mops, soap and cleaning appliances	277 40
Fuel	1,996 23

Light—gas, oil and candles - - -	646 61
Water - - - - -	150 00
Hay and straw - - - - -	18 00
Clothing for patients - - - -	....
Ice - - - - - -	107 08
Salaries and wages - - - -	5,348 00
Taxes and insurance - - - -	67 45
Coffins and funerals - - - -	....
Contingencies - - - - -	550 82
Repairs, ordinary - - - -	474 91
Total - - - - -	$17,860 97

Government Grant for 1894.

Allowance for Hospital cases, 17,028 days, at 20 cents	$3,405 60
Supplementary allowance, at 10 cents - -	1,702 80
Allowance for improper cases for Hospital treatment, 2,453 days, at 7 cents - - -	171 71
Total - - - - -	$5,280 11

INSPECTIONS.

I inspected the Hospital on the 27th January, when there were 56 patients 29 men and 27 women.

The books showed that 241 patients had been received since the 1st October and 19 had died.

The public wards, private rooms, bath-rooms, water-closets, wash-rooms, operating-rooms, dispensary, etc., were all clean and in good order.

It is to be regretted that in this Hospital there are a number of incurable cases occupying beds that should be available for patients who might be materially benefitted by the treatment. The incurables should be removed to a home for that purpose.

It would be well, I think, for the Hospital authorities to consider the advisability of erecting a new hospital or remodelling the present one, as the structure is old.

I instructed Mr. Aikens to make the second inspection of this Hospital. A copy of his report is annexed:

I made the second annual inspection of the General Hospital in London on July 30th. There were then 43 patients in residence, most of them surgery cases. This Hospital has fair appointments and means for carrying on its work. The staff consists of 15 regular nurses besides the physicians in charge. There is about 80 beds in the building. The house surgeon accompanied me over the building, which is conducted on a very good basis. The location affords fine natural facilities for drainage and ventilation. I inspected the office appointments and books and found them on a par with the rest of the building.

ST. JOSEPH'S HOSPITAL, LONDON.

The following summaries show the operations of this Hospital during the official year:

Movements of Patients.

Number under treatment, 1st October, 1893	12	
Admitted	327	
Total number under treatment		339
Discharged	291	
Died	16	
Under treatment, 30th September, 1894	32	
		339

Places Admitted From.

City of London	235	
County of Middlesex	37	
Other counties	61	
United States	6	
Other countries	..	
		339

Sex.

Male	143	
Female	196	
		339

Nationalities.

Canadian	240	
English	24	
Irish	51	
Scotch	12	
United States	10	
Other countries	2	
		339

Religious Denominations.

Protestant	185	
Roman Catholic	154	
		339

The following table gives a summary of certain diseases treated in the St. Joseph's Hospital, London, during the year:

	No. of cases treated.
Typhoid fever	17
Typhus fever	..
Puerperal Fever	..
Cerebro spinal fever	..
Diphtheria	12
Smallpox	..

Revenue.

From the Province of Ontario	$720 80
From the City of London	......
From the County of Middlesex	......
From paying patients	3,038 42
Income from property	......
Subscriptions, donations, etc.	73 34
Other sources	546 06
Total	$4,378 62

Expenditures.

Butchers' meat	$427 70
Butter	141 05
Flour, bread and meal	150 00
Milk	248 70
Tea and coffee	100 00
Potatoes and other vegetables	141 05
Groceries and provisions, not enumerated	579 50
Drugs and medicines	237 27
Surgical instruments	......
Medical and surgical appliances	127 79
Beer, wine and spirits	80 90
Bedding, napery and general house furnishings	770 06
Brooms, brushes, mops, soap and cleaning appliances	30 15
Fuel	538 00
Light—gas, oil and candles	153 85
Water	76 90
Hay and straw	......
Clothing for patients	21 80
Ice	10 00
Salaries and wages	294 68
Taxes and insurance	......
Coffins and funerals	33 57
Contingencies	116 70
Repairs, ordinary	92 00
Total	$4,371 67

Government Aid for 1894.

Allowance for Hospital cases, 8,184 days, at 20 cents	$1,636 80
Supplementary allowance of 10 cents	818 40
Allowance, improper cases for Hospital treatment, 847 days at 7 cents	59 29
Total	$2,514 49

INSPECTIONS.

I made an inspection of this Hospital on the 25th January.

The new building, which is now occupied, is well situated on high ground. It is five stories in height, and presents an imposing appearance. The basement contains the engine room, two hot water heaters, cupboards, a room for committee meetings, laundry, engineer's and servants' rooms, water-closet, clothes chute, ventilating shaft, scullery, kitchen, dining-room, vegetable and grocery rooms, wood and coal rooms.

On the first flat are private rooms, bath-rooms, water-closets, clothes chute and dust chute, main entrance from the south and an exit to the rear, offices, waiting-room, sewing-room, and a covered passage to the old building, which is to be used as an infirmary and for convalescents when required.

The second flat is a duplicate of the first, except that on this flat the chapel is situated. This flat is also connected with the old Hospital building by a covered way.

The third flat is also a duplicate of the first flat, with a gallery overlooking the chapel, for those patients who are not able to be taken down stairs.

There are two large wards, capable of holding sixteen patients each, with a number of smaller wards and private rooms. The system of heating throughout is by hot water, while a number of the rooms are also supplied with fire grates. The rooms are all well furnished.

The operating room is in the attic, and is well lighted with windows and sky-light. The plumbing is good in every respect. The closets and bath-rooms are practically separated from the main building, and there is good drainage and ventilation.

The Institution is supplied with city water and gas.

All classes suitable for hospital treatment are admitted. Those able to pay are charged from $4 to $15 per week, but those in public wards do not pay anything.

There have been received since the 1st October, 117 patients, and 5 have died. On the day of my visit there were 32 patients under treatment—15 men, 15 women and 2 children. More than one-half of the persons received in this Hospital are of the Protestant religion.

I instructed Mr. Aikens to make the second inspection of this Hospital. A copy of his report is annexed.

I inspected St. Joseph's Hospital, at your request, on July 30th. The general condition of this Institution is first-class in every respect. The Hospital is new, finished very neatly and supplied with all conveniences for high class work. Throughout the building was apparent all that tends to make sick people well, and to alleviate pain. Many of the pay wards are furnished elegantly and in perfect taste. The new building has sixty beds, and the infectious ward in the old building has seven beds. The total cost, I was told, was between $35,000 and $40,000. The daily record, when examined, showed the names of twenty-three inmates being treated on the day of my visit. Since October 1st, 260 patients have been admitted. The books and other records were very satisfactory.

GENERAL AND MARINE HOSPITAL, ST. CATHARINES.

The following summaries show the operations of this Hospital during the official year:

Movements of Patients.

Number under treatment, 1st October, 1893	32	
Admitted	260	
Births in Hospital	7	
Total number under treatment		299
Discharged	255	
Died	12	
Under treatment, 30th September, 1894	32	
		299

Places Admitted From.

From the City of St. Catharines	129	
From the County of Lincoln	66	
From other counties in the Province, and sailors	90	
From the United States	14	
From other countries	...	
		299

Sex.

Male	181	
Female	118	
		299

Nationalities.

Canadian	174	
English	57	
Irish	35	
Scotch	7	
United States	19	
Other countries	7	
		299

Religious Denominations.

Protestant	221	
Roman Catholic	74	
Other religions (or not known)	4	
		299

The following table gives a summary of certain diseases treated in the General and Marine Hospital, St. Catharines, during the year:

	No. of cases treated.
Typhoid fever	10
Typhus fever	..
Puerperal fever	..
Cerebro spinal fever	..
Diphtheria	1
Smallpox	..

Revenue.

From the Province of Ontario - - -	$2,349 51
From the Dominion Government - -	287 10
From the City of St. Catharines - - -	600 00
From the County of Lincoln - - -	500 00
From other municipalities, County of Welland -	300 00
From patients themselves for maintenance and treatment	1,562 80
From endowments, investments, or other property belonging to the Hospital - - -	40 78
From subscriptions, bequests and donations of private persons - - - - - -	594 06
From all other sources not above enumerated -	70 00
Total - - - - - -	$6,304 25

Expenditures.

Butchers' meat - - - - -	$543 01
Butter - - - - - -	259 58
Flour, bread and meal - - - -	224 74
Milk - - - - - -	367 30
Tea and coffee - - - - -	104 33
Potatoes and other vegetables - - -	194 47
Groceries and provisions not enumerated - -	443 29
Drugs and medicines - - - -	486 85
Medical and surgical appliances - - -	172 48
Surgical instruments - - - -	8 84
Beer, wine and spirits - - - -	46 50
Bedding, napery and general house furnishings -	133 59
Brooms, brushes, mops, soap and cleaning appliances	66 84
Fuel - - - - - - -	268 65
Light—gas, oil and candles - - -	170 88
Water supply - - - - -	13 00
Hay and straw - - - - -	8 75
Clothing for patients - - - - -	......
Ice - - - - - -	18 00
Salaries and wages - - - - -	1,761 95
Taxes and insurance - - - -	48 00
Contingencies - - - - -	176 11
Stationery, advertising, printing, postage, etc -	......
Repairs, ordinary - - - - -	271 08
Total - - - - - -	$5,788 24

Government Grant for 1894.

Allowance for Hospital cases, 9,481 days, at 20 cents -	$1,896 20
Supplementary allowance, at 10 cents - -	948 10
Allowance for improper cases for Hospital treatment, 347 days at 7 cents - - - -	24 29
Total - - - - - -	$2,868 59

Inspections.

I visited this Hospital on the 9th July. On that day there were 20 patients under treatment—13 males and 7 females. There have been admitted since the 1st October 196.

The private rooms and public wards were clean and in good order; likewise the bath-rooms, water-closets, operating-room, dispensary, etc. There is a separate frame building on the premises used as a nurse's home.

The Hospital is well managed, and there is a good medical and nursing staff. The books are properly kept.

I instructed Mr. Nicholson to make the second inspection of this Hospital. A copy of his report is annexed.

I beg to state that I made an inspection of the Hospital on the 15th September. There were in residence on that day 31 patients—21 adult males, 8 adult females and 2 children. Two hundred and eighty-five patients have been under treatment since the 1st October. I went over the Hospital building and found it in good order throughout.

I also visited the nurse's training school—a very comfortably furnished home. There are ten nurses in training.

GALT HOSPITAL, GALT.

The following summaries show the operations of this Hospital during the official year:

Movements of Patients.

Number under treatment, 1st October, 1393	11	
Admitted	175	
Number of births in the Institution	3	
Total number under treatment		189
Discharged	161	
Died	15	
Under treatment, 30th September, 1894	13	
		189

Places Received From.

From the Town of Galt	119	
From the County of Waterloo	56	
Other counties	13	
United States	1	
Other countries	..	
		189

Sex.

Male	104	
Female	85	
		189

Nationalities.

Canadian	136	
English	20	
Irish	6	
Scotch	13	
United States	9	
Other countries	5	
		189

Religious Denominations.

Protestant	181	
Roman Catholic	8	
Other religions, or not known	..	
		189

The following table gives a summary of certain diseases treated in the Galt Hospital, Galt, during the year:

	No. of cases treated.
Typhoid fever	20
Typhus fever	..
Puerperal fever	..
Cerebro spinal fever	..
Diphtheria	..
Smallpox	..

Revenue.

From the Province of Ontario	$1,226 40
From the Town of Galt	1,000 00
From the County of Waterloo	1,000 00
From paying patients themselves	1,712 70
From subscriptions, bequests and donations of private individuals	604 33
From all other sources	94 40
Total	$5,637 83

Expenditures.

Butchers' meat	$ 371 59
Butter	86 90
Flour, bread and meal	125 13
Milk	177 96
Tea and coffee	38 20
Potatoes and other vegetables	79 29
Groceries and provisions, not enumerated	210 92
Drugs, medicines, and surgical appliances, etc	438 52
Beer, wine and spirits	34 45
Bedding, napery and general house furnishings	196 54
Brooms, brushes, mops, soap and cleaning appliances	170 83
Fuel	610 45
Light—gas, oil and candles	126 05
Water	50 00
Hay and straw	......
Clothes for patients, including boots and shoes	......
Ice	25 00
Salaries and wages	1,318 55
Taxes and insurance	10 00
Coffins and funerals	......
Contingencies, advertising, postage, etc.	189 36
Repairs, ordinary	148 86
Total	$4,408 60

Government Aid for 1894.

Allowance for Hospital cases, 4,531 days at 20 cents	$ 906 20
Supplementary allowance, at 10 cents per day -	453 10
Allowance for improper cases for Hospital treatment, 80 days at 7 cents - - - -	5 60
Total - - - - -	$1,364 90

Inspections.

This Hospital was inspected by me on the 7th June, when there were 19 patients under treatment, 11 men, 7 women and 1 child. The patients admitted during the year numbered 121, and 8 deaths were recorded for the same period.

The public wards and private rooms were clean and in good order. also the operating-room, dispensary, etc., were well kept.

The books were properly written up.

I instructed Mr. Aikens to make the second inspection of this Hospital a copy of his report is annexed:

I inspected the Hospital at Galt on the morning of October 8th, a few minutes after the duties of the day had begun. The number of inmates corresponded with the entries in the books for that morning, and were seven in number. During the past season a laundry and drying closet has been attached to the Institution, also a room designed for a morgue. These will be no doubt found very convenient, especially the former. Everything connected with the building, the drainage, ventilation, water supply and closets, were giving the utmost satisfaction, as were also the matron and nurses in charge. I compared the Hospital register with the daily record in many places, and concluded that regular and systematic attention had been bestowed upon the books.

GENERAL HOSPITAL, GUELPH.

The following summaries show the operations of this Hospital during the official year:

Movements of Patients.

Number under treatment, 1st October, 1893	33	
Admitted	426	
Births in the Hospital	7	
Total number under treatment		466
Discharged	419	
Died	26	
Under treatment, 30th September, 1894	21	
		466

Places Received From.

City of Guelph	246	
County of Wellington	129	
Other counties in the Province	86	
From United States	5	
From other countries, foreigners and aliens	....	
		466

Sex.

Male	237	
Female	229	
		466

Nationalities.

Canadian	329	
English	51	
Irish	30	
Scotch	26	
United States	18	
Other countries	12	
		466

Religious Denominations.

Protestant	429	
Roman Catholic	35	
Other religions, or not known	2	
		466

The following table gives a summary of certain diseases treated in the General Hospital, Guelph, during the year :

	Number of cases treated.
Typhoid fever	13
Typhus fever	..
Puerperal fever	..
Cerebro spinal fever	..
Diphtheria	9
Smallpox	..

Revenue.

Received from the Province of Ontario	$3,025 45
From the City of Guelph	500 00
From the County of Wellington	1,000 00
From paying patients	3,937 50
Subscriptions, donations, etc.	4,206 00
From sources not enumerated	1,082 05
Total	$13,751 00

Expenditures.

Butchers' meat	$ 874 04
Butter	326 44
Flour, bread and meal	204 68
Milk	105 65
Tea and coffee	43 30
Potatoes and other vegetables	47 05
Groceries and provisions not enumerated	950 42
Drugs and medicines	627 59
Surgical instruments and appliances	181 57
Beer, wine and spirits	217 24
Bedding, napery and general house-furnishings	531 18
Brooms, brushes, mops, etc.	140 54
Fuel	1,069 46
Light—gas, oil and candles	281 03
Water supply	40 00
Hay and straw	....
Clothing	....
Ice	20 00
Salaries and wages	2,603 22
Taxes and insurance and rent	378 96
Contingencies	831 31
Repairs, ordinary	312 11
Total	$9,785 79

Government Aid for 1894.

Allowance for Hospital cases, 10,956 days, at 20 cents	$2,191 20
Supplementary allowance, at 10 cents - -	1,095 60
Allowance for improper cases for Hospital treatment, 566 days at 7 cents - - - -	39 62
Total - - - - -	$3,326 42

Inspections.

I made an inspection of the General Hospital, Guelph, on the 22nd January. There were then registered as patients 15 men, 8 women and 1 child—a total of 24.

The records showed that since the 1st October 114 patients had been admitted and 5 had died

There is an outbuilding for infectious cases. The Institution is managed by a hospital board.

The public and private wards, bath-rooms, water-closets, wash-rooms, dispensary, etc., were all clean and in good order. The building is heated with hot water, lighted with gas and supplied with city water. The drainage and ventilation are good.

There is a good staff of medical men and nurses.

I instructed Mr. Aikens to make the second inspection of this Hospital. A copy of his report is annexed:

I inspected the General Hospital at Guelph on July 23rd. On that date there were 20 male patients, 15 females and 3 children in the Institution. This is a large number for a city the size of Guelph, especially when there is another hospital in the place.

The staff consists of 12 nurses, besides the lady superintendent and house surgeon. No improvements or changes of any importance are being carried on this season, nor has anything particular transpired since your last visit. Surgery more than any other feature of medical practice is gradually growing in popularity throughout the several hospitals, and the majority of the patients in the General Hospital at Guelph were of that class.

The ventilation and drainage seems to be very satisfactory, the cesspool being situated about 15 rods or more from the building.

The Hospital books were examined and were found quite complete and entered up to date.

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ST. JOSEPH'S HOSPITAL, GUELPH.

The following summaries show the operations of this Hospital during the official year:

Movements of Patients.

Number under treatment, 1st October, 1893	25	
Admitted	309	
Total number under treatment		334
Discharged	304	
Died	7	
Under treatment, 30th September, 1894	23	
		334

Places Admitted From.

City of Guelph	125	
County of Wellington	103	
Other counties	106	
Other countries	....	
		334

Sex.

Male	140	
Female	194	
		334

Nationalities.

Canadian	195	
English	18	
Irish	103	
Scotch	7	
United States	1	
Other countries	10	
		334

Religious Denominations.

Protestant	36	
Roman Catholic	298	
		334

The following table gives a summary of certain diseases treated in the St. Joseph's Hospital, Guelph, during the year:

	No. of cases treated.
Typhoid fever	7
Typhus "	..
Puerperal "	..
Cerebro spinal fever	..
Diphtheria	2
Smallpox	..

Revenue.

From the Province of Ontario	$1,980 61
From the City of Guelph	100 00
From the County of Wellington	800 00
From paying patients	634 02
Income from property	300 00
Subscriptions, donations, etc.	367 53
Other sources	223 40
Total	$4,405 56

Expenditures.

Butchers' meat	$639 76
Butter	96 21
Flour, bread and meal	295 32
Milk	270 00
Tea and coffee	112 00
Potatoes and other vegetables	99 75
Groceries and provisions, not enumerated	654 36
Drugs and medicines and surgical appliances	227 44
Beer, wine and spirits	135 00
Bedding, napery and general house furnishings	342 54
Brooms, brushes, mops, soap and cleaning appliances	169 00
Fuel	340 29
Light—gas, oil and candles	27 65
Hay and straw	5 86
Clothing for patients, including boots and shoes	54 00
Ice	4 40
Salaries and wages	216 00
Taxes and insurance	29 60
Contingencies	601 38
Repairs, ordinary	476 94
Total	$4,797 50

Government Grant for 1894.

Allowance for Hospital cases, 11,098 days at 20 cents	$2,219 60
Supplementary allowance of one-fourth of receipts other than Government	606 23
Allowance for improper cases for Hospital treatment, 131 days at 7 cents	9 17
Total	$2,835 00

INSPECTIONS.

I made an inspection of the St. Joseph's Hospital, Guelph, on the 22nd January. There were 28 patients under treatment on that day, viz., 10 men and 18 women. Since the 1st October the admissions were 88, and the deaths 10.

All the different departments were clean and in good order. I found no change in the building or premises since my last visit. There is a good staff of nurses and medical attendants. The books were well kept.

I instructed Mr. Aikens to make a second inspection of this Hospital. A copy of his report is annexed.

On July 23rd I made the second inspection of the St. Joseph's Hospital, Guelph, and found by the books that 19 patients were being treated, 9 males and 10 females. The great difficulty encountered here is the absence of city water. The Hospital is located just outside the corporation, and is of course beyond the reach of the water pipes. Nevertheless the sisters keep the building very neat, clean and comfortable. Their whole attention now, apart from the care of the patients, is devoted to the erection of a new building, which is estimated to cost $20,000, and when finished will contain 40 beds. The old building will then be occupied by the inmates of the House of Providence adjoining, and will be much more commodious for the purpose than the present old structure. I inspected the daily record, and found it very neat and entered up to date.

GENERAL HOSPITAL, PEMBROKE.

The following summaries show the operations of this Hospital during the official year:

Movements of Patients.

Number under treatment, 1st October, 1893	15	
Admitted	260	
Total number under treatment		275
Disharged	246	
Died	13	
Under treatment 30th September, 1894	16	
		275

Places Received From.

From the Town of Pembroke	55	
From the County of Renfrew	145	
Other counties	67	
United States	..	
Other countries	8	
		275

Sex.

Male	138	
Female	137	
		275

Nationalities.

Canadian	205	
English	17	
Irish	39	
Scotch	4	
United States	2	
Other countries	8	
		275

Religious Denominations.

Protestant	27	
Roman Catholic	248	
		275

The following table gives a summary of certain diseases treated in the General Hospital, Pembroke, during the year:

	No. of cases treated.
Typhoid fever	7
Typhus "	..
Puerperal "	..
Cerebro spinal fever	..
Diphtheria	4
Smallpox	..

Revenue.

From the Province of Ontario	$1,662 60
From the Counties of Renfrew aud Pontiac, etc.	250 00
From the city of Quebec	......
From patients themselves	1,442 40
From subscriptions, bequests and donations of private individuals	489 00
From all other sources	863 81
Total	$4,707 81

Expenditures.

Butchers' meat	$563 82
Butter	280 25
Flour, bread and meal	247 00
Milk	74 20
Tea and coffee	115 95
Potatoes and other vegetables	175 23
Groceries and provisions, not enumerated	408 34
Drugs, medicines, and surgical appliances	322 40
Beer, wine and spirits	64 48
Bedding, napery and general house furnishings	838 82
Brooms, brushes, mops, soap and cleaning appliances	77 40
Fuel	358 61
Light—gas, oil and candles	58 80
Water	55 80
Hay and straw	170 40
Clothes for patients, including boots and shoes	19 80
Ice	18 95
Salaries and wages	636 00
Taxes	5 63
Coffins and funerals	29 00
Contingencies	70 84
Repairs, ordinary	34 50
Total	$4,626 22

Government Grant, 1894.

Allowance for Hospital cases, 6,967 days at 20 cents	$1,393 40
Supplementary allowance at 10 cents - - -	696 70
Allowance for improper cases for Hospital treatment, 77 days at 7 cents - - - - - -	5 39
Total - - - - - -	$2,095 49

INSPECTIONS.

On the 9th February I inspected the General Hospital, Pembroke, and found 14 patients under treatment—7 men and 7 women. Since the 1st October the admissions were 94; deaths, 2. This Hospital has accommodation for 40 patients It is a new stone building, three and a half storeys high. In the basement are the servants' rooms, sewing-room. dining and sitting-rooms, kitchen, pantry, vegetable cellar, and furnace room.

On the first floor are the main entrance, two public wards, sitting-room, bath-rooms, wash-rooms and water-closets; also lady superintendent's office and bed-room, clothes press, telephone, surgery and operating room. There are two side entrances on this floor.

Second floor—Sitting-room, sisters' and nurses' rooms, private rooms, public wards, bath-rooms, water-closets, dumb waiter, etc.

Third floor, or attic—On this floor is situated the chapel, tank-room, trunk-rooms, public wards, servants' rooms, etc. Town water is not used. The water-closets are supplied from the tank. It is the intention to obtain water from the town system soon.

In connection with the Hospital there are sheds, stables, laundry, morgue, coal and ice-houses.

There are two acres of ground around the Hospital.

There is a good staff of medical men and nurses. The books are well kept.

I made an inspection of this Hospital on the 20th December. There were 18 patients on that date. The admissions during the year numbered 275, and the deaths, 13.

There has been no change in the building and grounds since my last inspection. The building is well heated with hot water and lighted with electric light. Water is now supplied from the town system.

The public and private wards, operating-room, dispensary, water-closets and bath-rooms, laundry, kitchen and dining-rooms were all clean and in good order.

The drainage is defective and must be attended to as soon as possible for the safety of the inmates and success of the Institution. The management is good.

GENERAL HOSPITAL, MATTAWA.

The following summaries show the operations of this Hospital during the official year:

Movements of Patients.

Number under treatment, 1st October, 1893	16	
Admitted	384	
Total number under treatment		400
Discharged	351	
Died	12	
Under treatment, 30th September, 1894	37	
		400

Places Received From.

From the Town of Mattawa	189	
From the District of Nipissing	147	
From other counties in the Province	58	
United States and other countries	6	
		400

Sex.

Male	328	
Female	72	
		400

Nationalities.

Canadian	227	
English	14	
Irish	99	
Scotch	8	
United States	2	
Other countries	50	
		400

Religious Denominations.

Protestant	76	
Roman Catholic	318	
Other religions	6	
		400

The following table gives a summary of certain diseases treated in the General Hospital, Mattawa, during the year:

	No. of cases treated.
Typhoid fever	12
Typhus	....
Puerperal	....
Cerebro spinal fever	....
Diphtheria	13
Smallpox	....

Revenue.

From the Province of Ontario	$1,462 70
From Town of Mattawa	.... ..
From County of Pontiac	50 00
From patients for maintenance and treatment	1,493 61
From subscriptions, bequests and donations of private individuals	315 97
From all other sources	1,265 73
Total	$4,588 01

Expenditures.

Butchers' meat	$ 875 90
Butter	250 40
Flour, bread and meal	392 00
Milk	107 30
Tea and coffee	68 00
Potatoes and other vegetables	142 45
Groceries and provisions not enumerated	216 82
Drugs and medicines	175 20
Beer, wine and spirits	102 65
Bedding, napery and general house furnishings	78 00
Brooms, brushes, etc.	75 20
Fuel	333 00
Light—gas, oil and candles	89 20
Water supply	23 00
Hay and straw	178 50
Clothing for patients	69 07
Ice	16 00
Salaries and wages	708 00
Taxes and insurance	50 00
Coffins and funerals	37 50
Repairs, ordinary	50 00
Contingencies	90 00
Total	$4,128 19

Government Grant for 1894.

Allowance for Hospital cases, 7,436 days at 20 cents	$1,487 20
Supplementary allowance at 10 cents per day	743 60
Allowance for improper cases for Hospital treatment, 94 days at 7 cents per day	6 58
Total	$2,237 38.

INSPECTIONS.

I visited the General Hospital, Mattawa, on the 24th July.

There were 16 patients—11 men and 5 women. Since the beginning of the official year 288 patients have been admitted, and 11 have died.

All the private rooms and public wards were clean and in good order, likewise the dispensary, operating-room, nurse's rooms, dining-rooms, etc.

There is a small, detached building used for cases of diphtheria and scarlet fever. There is also a morgue or dead-house on the premises.

The Hospital is lighted with coal oil, heated with steam, and supplied with well water.

THE JOHN H. STRATFORD HOSPITAL, BRANTFORD.

The following summaries show the operations of this Hospital during the official year:

Movements of Patients.

Number under treatment, 1st October, 1893	22	
Admitted	295	
Births in the Hospital	7	
Total number under treatment		324
Discharged	272	
Died	18	
Under treatment, 30th September, 1894	34	
		324

Places Admitted From.

From the City of Brantford	296	
From the County of Brant	21	
Other counties	7	
United States	....	
		324

Sex.

Male	177	
Female	147	
		324

Nationalities.

Canadian	204	
English	66	
Irish	21	
Scotch	17	
United States	6	
Other countries	10	
		324

Religious Denominations.

Protestant	276	
Roman Catholic	41	
Other religions or not known	7	
	—	324

The following table gives a summary of certain diseases treated in the John H. Stratford Hospital, Brantford, during the year:

	Number of cases treated.
Typhoid fever	39
Typhus "	....
Puerperal "	1
Cerebro spinal fever	....
Diphtheria	....
Smallpox	....

Revenue.

From the Province of Ontario	$1,984 52
From the City of Brantford	1,000 00
From the County of Brant	500 00
From patients for maintenance and treatment	938 75
From subscriptions, donations and bequests from private individuals	.... ..
From all other sources	$1,488 62
Total	$5,911 89

Expenditures.

Butchers' meat	$438 69
Butter	257 64
Flour, bread and meal	179 15
Milk	558 51
Tea and coffee	42 93
Potatoes and other vegetables	69 25
Groceries and provisions not enumerated	286 06
Drugs and medicines	209 08
Medical and surgical appliances	48 68
Surgical instruments	....
Beer, wine and spirits	1 25
Bedding, napery and general house furnishings	158 33
Brooms, brushes, mops, soap and cleaning appliances	71 55
Fuel	441 46
Light—gas, oil and candles	164 27
Water supply	....
Hay and straw	....
Clothing for patients, including boots and shoes	....
Ice	57 50
Salaries and wages	2,608 36
Taxes and insurance	130 05
Coffins and funerals	7 00
Contingencies	140 61
Repairs, ordinary	329 81
Total	$6,200 18

Government Grant for 1894.

Allowance for Hospital cases, 7,287 days at 20 cents	$1,457 40
Supplementary allowance of 10 cents per day -	728 70
Allowance for improper cases for Hospital treatment, 704 days, at 7 cents - - -	49 28
Total - - - - -	$2,235 38

INSPECTIONS.

I made an inspection of the John H. Stratford Hospital, Brantford, on the 4th August, and found 9 patients under treatment—3 men, 5 women and 1 boy. Since the 1st October the admissions were 230 and the deaths 13.

The building and premises were in good order. All the private rooms and public wards were neat and clean; also the dispensary, operating-room, water-closets, bath-rooms, etc., were in good condition. The books were found to be properly entered up.

ST. JOSEPH'S HOSPITAL, PORT ARTHUR.

The following summaries show the operations of this Hospital during the official year:

Movements of Patients.

Number under treatment, 1st October, 1893 - - -	11	
Admitted - - - - - - -	112	
Total number under treatment - - -		123
Discharged - - - - - - -	104	
Died - - - - - - - -	12	
Under treatment, 30th September, 1894 - -	7	
		123

Places Admitted From.

From the Town of Port Arthur and Thunder Bay District -	52	
From the County of Algoma - - - - -	42	
From other parts of the Province - - - -	6	
From the United States - - - -	2	
From other countries, including emigrants, foreigners and aliens - - - - - -	21	
		123

Sex.

Male - - - - - -	91	
Female - - - - - -	32	
		123

Nationalities.

Canadian	38	
English	21	
Irish	27	
Scotch	5	
United States	6	
Other countries	26	
		123

Religious Denominations.

Protestant	73	
Roman Catholic	40	
Other denominations	10	
		123

The following table gives a summary of certain diseases treated in the St. Joseph's Hospital, Port Arthur, during the year:

	No. of cases treated.
Typhoid Fever	6
Typhus "	..
Puerperal "	..
Cerebro spinal fever	..
Diphtheria	..
Smallpox	..

Revenue.

From the Province of Ontario	$1,134 89
From the Town of Port Arthur	400 00
From County of Algoma	100 00
From other municipalities in the Province	300 00
From paying patients themselves	214 00
From subscriptions, donations, etc.	300 00
From other sources	......
Total	$2,448 89

Expenditures.

Butchers' meat	$266 66
Butter	125 00
Flour, bread and meal	198 00
Milk	200 00
Tea and coffee	75 50
Potatoes and other vegetables	123 90
Groceries and provisions, not enumerated	250 00
Drugs and medicines	250 00
Surgical instruments and appliances	75 00
Beer, wine and spirits	105 00
Bedding, etc.	45 00
Brooms, brushes, mops, soap and cleaning appliances	41 00
Fuel	203 00

Light—gas, oil and candles	$36 55
Water supply	55 00
Ice supply	25 00
Hay and straw	115 00
Clothing for patients, including boots and shoes	98 00
Salaries and wages	341 00
Taxes and insurance	......
Coffins and funerals	......
Contingencies	45 00
Repairs, ordinary	135 00
Total	$2,808 61

Government Grant for 1894.

Allowance for Hospital cases, 3,069 days at 20 cents	$613 80
Supplementary allowance, at 10 cents	306 90
Allowance for improper cases for Hospital treatment, 147 days at 7 cents	10 29
Total	$930 99

Inspections.

I made an inspection of the St. Joseph's Hospital, Port Arthur, on the 13th August, and found the building and premises in satisfactory order. The public wards, private rooms, and other apartments, were all well kept.

There were five patients on the day of my visit, all men. There had been admitted since the 1st October, 97, and 12 had died. Of the 97 patients, 61 were of Protestant persuasion.

The building is heated by hot water, supplied with tank water, and lighted with coal oil. There is good drainage and ventilation.

BELLEVILLE HOSPITAL, BELLEVILLE.

The following summaries show the operations of this Hospital during the official year:

Movements of Patients.

Number under treatment, 1st October, 1893	13	
Admitted	224	
Births in Hospital	3	
Total number under treatment		240
Discharged	217	
Died	10	
Under treatment, 30th September, 1894	13	
		240

Places Admitted From.

From the City of Belleville	169	
From the County of Hastings	57	
Other counties	11	
Other countries, United States	3	
		240

Sex.

Male	130	
Female	110	
		240

Nationalities.

Canadian	157	
English	27	
Irish	30	
Scotch	12	
United States	12	
Other countries	2	
		240

Religious Denominations.

Protestant	201	
Roman Catholic	39	
Other religions, or not known	....	
		240

The following table gives a summary of certain diseases treated in the Belleville Hospital during the year:

	No. of cases treated.
Typhoid fever	16
Typus "	..
Puerperal "	..
Cerebro spinal fever	...
Diphtheria	1
Smallpox	..

Revenue.

From the Province of Ontario	$1,535 53
From the City of Belleville	517 00
From the County of Hastings	......
From patients for maintenance and treatment	1,572 60
From subscriptions, donations and bequests from private individuals	785 10
From other sources	1,830 67
Total	$6,240 90

Expenditures.

Butchers' meat	$ 321 37
Butter	263 06
Flour, bread and meal	134 21
Milk	224 88
Tea and coffee	65 35
Potatoes and other vegetables	108 28
Groceries and provisions not enumerated	311 15
Drugs and medicines	337 99
Medical and surgical appliances	1,019 39
Beer, wine and spirits	49 45
Bedding, napery and general house furnishings	498 44
Brooms, brushes, mops, soap and cleaning appliances	3 66
Fuel	641 00
Light—gas, oil and candles	259 50
Water	....
Hay and straw	15 25
Clothing for patients	46 68
Ice supply	23 33
Salaries and wages	1,456 00
Taxes and insurance	......
Contingencies	130 25
Coffins and funerals	7 00
Repairs, ordinary	149 95
Total	$6,066 19

Government Grant for 1894.

Allowance for Hospital cases, 6,026 days at 20 cents	$1,205 20
Supplementary allowance at 10 cents	602 60
Allowance for improper cases for Hospital treatment, 192 days at 7 cents	13 44
Total	$1,821 24

INSPECTIONS.

I visited this Hospital on the 21st February. The patients then numbered 20, viz., 9 men and 11 women. Since the 1st October the admissions were 70, deaths 2.

The wards and private rooms, dispensary, etc., were clean and in good order. A room has lately been fitted up for an operating-room, with new appliances.

The Hospital is well supplied with nurses, and there is a good staff of medical men in attendance. The books are well kept.

My second inspection of this Hospital for the current year was made on the 19th September. On that day there were 19 patients, 10 men and 9 women. The admissions since the 1st October were 214, and the deaths 7. There were also three births.

All departments were clean and in good order, and the books were properly kept.

ST. VINCENT DE PAUL HOSPITAL, BROCKVILLE

The operations of this Hopital during the period under report are indicated in the following summary :

Remaining under treatment, 1st October, 1893	11	
Admitted	127	
Number of births in the Hospital	..	
Total number under treatment		138
Discharged	119	
Died	7	
Under treatment on 30th September, 1894	12	
		138

Places Admitted From.

From the Town of Brockville	54	
From the Counties of Leeds and Grenville	69	
From other counties in the Province	7	
From United States	8	
		138

Sex.

Male	138	
Female	..	
		138

Nationalities.

Canadian	77	
English	19	
Irish	24	
Scotch	9	
United States	7	
Other countries	2	
		138

Religious Denominations.

Protestant	66	
Roman Catholic	72	
Other religions (or not known)	..	
		138

The following table gives a summary of certain diseases treated in the St. Vincent de Paul Hospital, Brockville, during the year :

	No. of cases treated.
Typhoid fever	24
Typhus "	..
Puerperal "	..
Cerebro spinal fever	..
Diphtheria	..
Smallpox	..

The two annexed statements show the revenue and expenditure respectively of the Hospital during the year :

Revenue.

From the Province of Ontario	806 76
From the Town of Brockville	....
From Counties of Leeds and Grenville	100 00
From paying patients themselves	996 52
Subscriptions, donations and bequests of private individuals in cash	515 48
From all sources not enumerated	467 00
Total	$2,885 76

Expenditures.

Butchers' meat	417 50
Butter	128 33
Flour, bread and meal	132 18
Milk	139 50
Tea and coffee	119 00
Potatoes and other vegetables	123 40
Groceries and provisions not enumerated	220 00
Drugs and medicines and medical appliances	219 27

Beer, wine and spirits	$79 30
Bedding, napery and general house furnishings	174 00
Brooms, brushes, mops, soap and cleaning appliances	65 30
Fuel	298 50
Light—gas, oil and candles	62 15
Water	40 00
Hay and straw	....
Clothing for patients, including boots and shoes	60 00
Ice supply	20 50
Salaries and wages	125 50
Coffins and funerals	....
Contingencies	131 50
Repairs, ordinary	235 60
Total expenditure for maintenance	$2,791 53

Government Grant for 1894.

Allowance of 20 cents per day on 5,315 days' treatment of patients	$1,063 00
Supplementary allowance of ¼ of Hospital revenue	519 75
Allowance for improper cases for Hospital treatment, 19 days at 7 cents	1 33
Total	$1,584 08

INSPECTIONS.

This Hospital was inspected by me on the 23rd Febrnary, when there were 12 patients (9 men and 3 women) under treatment.

The records showed that 41 patients had been received since the 1st October, and 2 had died.

No change has taken place in this Institution since my last visit. The building is old, and requires some addition to it in order to do efficient hospital work. All the rooms were clean and well kept. There is a good staff of doctors and nurses.

I made an inspection of this Hospital on the 5th September. There were 6 patients in residence; 3 males and 3 females. The admissions since the 1st October were 109, and the deaths, 8.

There has been no change in the building and premises since my last visit. All the rooms were clean and in good order. A new wing for the accommodation of patients is very much required, and should be constructed forthwith.

THE BROCKVILLE GENERAL HOSPITAL.

The following summaries show the operations of this Hospital during the official year:

Number under treatment, on the 30th September, 1893	23	
Number admitted	195	
Number of births	2	
Total number under treatment		220
Discharged	186	
Died	16	
Remaining under treatment, on the 30th September, 1894	18	
		220

Places Admitted From.

From the Town of Brockville	121	
From the Counties of Leeds and Grenville	79	
From other counties in the Province	12	
From the United States	8	
Other countries	..	
		220

Sex.

Male	102	
Female	118	
		220

Nationalities.

Canadian	170	
English	13	
Irish	6	
Scotch	5	
United States	23	
Other countries	3	
		220

Religious Denominations.

Protestant	204	
Roman Catholic	16	
Other religions, or not known	..	
		220

The following table gives a summary of certain diseases treated in the Brockville General Hospital during the year:

	No of cases treated
Typhoid fever	8
Typhus "	..
Puerperal "	..
Cerebro spinal fever	..
Diphtheria	1
Smallpox	..

Revenue.

From the Province of Ontario - - -	$1,537 55
From the Town of Brockville - - -	200 00
From the Counties of Leeds and Grenville - -	200 00
From paying patients - - - - -	2,307 28
From property belonging to the Hospital - -	325 35
From subscriptions, bequests and donations of private individuals - - - - -	260 50
From other sources, not enumerated - - -	1,298 18
Total - - - - -	$6,128 86

Expenditures.

Butchers' Meat - - - - -	$ 428 53
Butter - - - - - -	283 81
Flour, bread and meal - - - -	121 20
Milk - - - - - - -	294 35
Tea and coffee - - - - -	134 73
Potatoes and other vegetables - - -	102 93
Groceries and provisions, not enumerated - -	664 48
Drugs and medicines - - - -	274 70
Medical and surgical appliances - - -	202 98
Beer, wine and spirits - - - -	92 10
Bedding, napery and general house furnishings -	199 95
Brooms, brushes, mops, soap and cleaning appliances	50 00
Fuel - - - - - - -	664 56
Light—gas, oil and candles - - -	72 85
Water supply - - - - -	42 50
Hay and straw - - - - -	....
Clothing for patients, including boots and shoes -	....
Ice supply - - - - -	25 00
Salaries and wages - - - - -	1,377 45
Taxes and insurance - - - -	....
Coffins and funerals - - - - -	..
Contingencies - - - - -	508 82
Repairs, ordinary - - - - -	216 40
Total - - - - -	$5,757 34

Government Grant for 1894.

Allowance for 5,735 days' treatment of patients, at 20 cents per day - - - -	$1,147 00
Supplementary allowance, at 10 cents - -	573 50
Allowance for improper cases for Hospital treatment 1,216 at 7 cents per day - - -	85 12
Total - - - - -	$1,805 62

Inspections.

I visited and inspected the General Hospital, Brockville, on the 2nd January.

There were remaining in Hospital at the close of the year (30th September), 23 patients, and 44 have been received since that date, and 2 have died. On this occasion there were 15 patients in residence; 3 men and 12 women and children.

The dispensary, operating-room, private and public wards, bath-rooms, water-closets, etc., were all in good order. Also the kitchen, laundry and coal rooms in the basement were in a well kept condition.

Since my last inspection a new fence has been placed around the grounds, making a great improvement. No other change has been made in connection with the building or grounds. The books were well kept, and the Institution has a good staff of medical attendants and nurses.

This Hospital was again inspected by me on the 28th of August, when there were 24 patients under treament, viz., 6 men, 12 women, and 5 children.

The number admitted during the year up to the present date is 162, and 11 have died.

I saw the different parts of the building, the public wards, private rooms, dispensary, operating-room, laundry, kitchen, furnace-room, cellars bath-rooms, water-closets etc., and found everything in a satisfactory condition.

Verandahs have been built lately on the south side of the building, with a fire escape connecting with the upper flat.

GENERAL AND MARINE HOSPITAL, COLLINGWOOD.

The following summaries show the operations of the Hospital during the official year:

Movements of Patients.

Number under treatment, 1st October, 1893	6	
Admitted	50	
Number of births in the Institution during the year	1	
Total number under treatment	—	57
Discharged	51	
Died	1	
Under treatment, 30th October, 1894	5	
	—	57

Places Received From.

From the Town of Collingwood	19	
From the Counties of Simcoe and Grey	23	
From other counties in the Province	6	
From United States	2	
From other countries	7	
	—	57

Sex.

Male	27	
Female	30	
	—	57

Nationalities.

Canadian	40	
English	9	
Irish	4	
Scotch	2	
United States	2	
Other countries	...	
	—	57

Religious Denominations.

Protestant	50	
Roman Catholic	6	
Other religions	1	
	—	57

The following table gives a summary of certain cases treated in the General and Marine Hospital, Collingwood, during the year:

	No. of cases treated.
Typhoid fever	....
Typhus "	....
Puerperal "	....
Cerebro spinal fever	....
Diphtheria	....
Smallpox	....

Revenue.

Received from the Province of Ontario	$ 392 62
From the Town of Collingwood	140 00
From the County of Simcoe	140 00
From paying patients	678 20
Subscriptions, donations, etc,	432 06
From sources not enumerated	2 75
Total	$ 1,785 63

Expenditures.

Butchers' meat	$ 103 86
Butter	79 23
Flour, bread and meal	80 22
Milk	11 30
Tea and coffee	26 11
Potatoes and other vegetables	17 87
Groceries and provisions not enumerated	166 24
Drugs and medicines	115 18
Surgical appliances	1 00
Beer, wine and spirits	7 95
Bedding, napery and general house furnishings	43 22
Brooms, brushes, mops, etc.	17 23
Fuel	185 59
Light—gas, oil and candles	21 28
Water supply	15 00
Hay and straw	10 00
Clothing	.....
Ice	......
Salaries and wages	645 35
Taxes and insurance	......
Contingencies	90 30
Repairs, ordinary	61 02
Interest and rent	......
Total	$ 1,697 95

Government Grant for 1894.

Allowance for Hospital cases, 1,809 days at 20 cents	361 80
Supplementary allowance, at 10 cents	180 90
Allowance for improper cases for Hospital treatment 976 days at 7 cents	68 32
Total	$ 611 02

THE NICHOL'S HOSPITAL, PETERBOROUGH.

The following summaries show the operations of this Hospital during the official year:

Movements of Patients.

Number under treatment, 1st October, 1893	22	
Admitted	282	
Births in Hospital	....	
Total number under treatment		304
Discharged	257	
Died	20	
Under treatment, 30th September, 1894	27	
		304

Places Received From.

From the Town of Peterborough	259	
From the County of Peterborough	45	
From other counties of the Province	....	
From the United States	....	
From other countries	....	
		304

Sex.

Male	154	
Female	150	
		304

Religious Denominations.

Protestant	298	
Roman Catholic	6	
Other religions (or not known)	....	
		304

Nationalities.

Canadian	160	
English	77	
Irish	28	
Scotch	27	
United States	11	
Other countries	1	
		304

The following table gives a summary of certain cases treated in the Nichol's Hospital, Peterborough, during the year :

	No. of cases treated.
Typhoid fever	22
Typhus fever	..
Puerperal fever	2
Cerebro spinal fever	..
Diphtheria	20
Smallpox	..

Revenue.

From the Province	$ 851 00
From the Town of Peterborough	1,800 00
From patients themselves, for maintenance and treatment,	1,383 05
From property belonging to the Hospital, endowments, etc.,	4,058 00
From subscriptions, donations, and bequests from private individuals	2,000 00
From other sources	16 33
Total	$10,108 38

Expenditures.

Butchers' meat	$ 485 00
Butter	141 60
Flour, bread and meal	282 32
Milk	133 97
Tea and coffee	74 65
Potatoes and other vegetables	327 12
Groceries and provisions, not enumerated	448 35
Drugs and medicines	704 67
Surgical instruments and appliances	37 86
Beer, wine and spirits	134 30
Bedding, napery and general house furnishings	425 89
Brooms, brushes, mops, soap and cleaning appliances	12 00
Fuel	523 96
Light—gas, oil and candles	318 01
Water supply	131 60
Clothing for patients	......
Ice	31 50
Salaries and wages	2,385 30
Taxes and insurance	......
Hay and straw	54 90
Contingencies	481 68
Repairs, ordinary	470 48
Total	$7,625 16

Government Grant for 1894.

Allowance for Hospital cases, 9,381 days at 20 cents per day	1,876 20
Supplementary allowance, at 10 cents	938 10
Allowance for improper cases for Hospital treatment, 652 days at 7 cents per day	45 64
Total	$2,859 94

Inspections.

I inspected this Hospital on the 18th January. There were 28 patients on that day—10 men, 15 women and 3 children. Since the first of the year (1st October) 81 patients have been received, and 7 deaths have occurred.

I visited the private and public wards and found them in nice order. The dispensary, operating-room, outbuildings, etc., were also in a well kept condition.

A good staff of medical men and nurses in attendance.

The sanitary arrangements as to plumbing, ventilation, etc., are excellent. The books were found to be properly kept.

I instructed Mr. Mann to make the second inspection of this Hospital. A copy of his report is annexed:

The Nichol's Hospital, Peterboro', was visited by me at your request on the 27th August, 1894. Laudatory remarks as to the general state and equipment of this Hospital have been very often pronounced on the occasion of visits by yourself and your predecessors as inspectors, and I can only add my quota to the list, every portion of the building having been visited and found in a satisfactory state.

There were nine male and six female patients under treatment, but none suffering from infectious diseases, although there had been several cases of diphtheria and scarlet fever during the year, all of which came from outside the city.

ST. JOSEPH'S HOSPITAL, PETERBOROUGH.

The following summaries show the operations of this Hospital during the official year :

Movements of Patients.

Number under treatment, 1st October, 1893	16	
Admitted	128	
Births in hospital	...	
Total number under treatment		144
Discharged	119	
Died	11	
Under treatment, 30th September, 1894	14	
		144

Places Received From.

From the Town of Peterborough	79	
From the County of Peterborough	55	
From other counties of the Province	..	
From the United States	..	
From other countries	10	
		144

Sex.

Male	87	
Female	57	
		144

Religious Denominations.

Protestant	14	
Roman Catholic	130	
		144

Nationalities.

Canadian	58	
English	1	
Irish	57	
Scotch	2	
United States	3	
Other countries	33	
		144

The following gives a summary of certain cases treated in the St. Joseph's Hospital, Peterborough, during the year:

	No. of cases treated.
Typhoid fever	4
Typhus fever	..
Puerperal fever	..
Cerebro spinal fever	..
Diphtheria	..
Smallpox	..

Revenue.

From the Province	$882 12
From the Town of Peterborough	......
From patients themselves for maintenance and treatment	440 50
From property belonging to the Hospital	......
From subscriptions, donations and bequests from private individuals	534 00
From all other sources	561 33
Total	$2,417 95

Expenditures.

Butchers' meat	$213 74
Butter	87 00
Flour, bread and meal	95 27
Milk	54 05
Tea and coffee	79 00
Potatoes and other vegetables	27 50
Groceries and provisions, not enumerated	73 00
Drugs and medicines	114 46
Surgical instruments and appliances	70 38
Beer, wine and spirits	60 71
Bedding, napery and general house furnishings	182 18
Brooms, brushes, mops, soap and cleaning appliances	31 50
Fuel	530 82
Light—gas, oil and candles	61 25
Hay and straw	41 40
Clothing for patients	21 59
Ice	10 00
Salaries and wages	360 00
Taxes and insurance	......
Coffins and funerals	31 50
Contingencies	157 84
Repairs, ordinary	104 81
Total	$2,408 00

Government Grant for 1894.

Allowance for Hospital cases, 2,885 days at 20 cents per day	$577 00
Supplementary allowance, at 10 cents	288 50
Total	$865 50

Inspections.

I beg to report that I made an inspection of the St. Joseph's Hospital, Peterborough, on the 18th January.

There were 13 patients under treatment on that day—9 men and 4 women—49 had been received since the 1st October last, and the records showed that two deaths had occurred in the same period. All the departments were clean and well kept. There was a good staff of medical men and nurses in attendance. The books were well kept.

I instructed Mr. Mann to make the second inspection of this Hospital. A copy of his report is annexed :

I made an inspection of the St. Joseph's Hospital in the City of Peterborough, on the 27th August, 1894, on which occasion there were 5 patients under treatment—4 males and 1 female. One of these patients was suffering from typhoid fever.

This Hospital is in its usual state, no structural alterations having taken place. The books were properly kept and the general condition of the building was good.

HOTEL DIEU HOSPITAL, WINDSOR.

The following summaries show the operations of this Hospital during the official year :

Movements of Patients.

Number under treatment, 1st October, 1893	21	
Admitted	141	
Total number under treatment		162
Discharged	122	
Died	13	
Under treatment, 30th September, 1894	27	
		162

Places Received From.

From the Town of Windsor	88	
From the County of Essex	34	
From other counties of the Province	7	
From United States	28	
From other countries	5	
		162

Sex.

Male	65	
Female	97	
		162

Nationalities.

Canadian	102	
English	12	
Irish	21	
Scotch	....	
United States	20	
Other countries	7	
		162

Religious Denominations.

Protestant	31	
Roman Catholic	129	
Other religions	2	
		162

The following table gives a summary of certain diseases treated in the Hotel Dieu Hospital, Windsor, during the year:

	No. of cases treated.
Typhoid fever	41
Typhus fever	....
Puerperal fever	....
Cerebro spinal fever	....
Diphtheria	....
Smallpox	....

Revenue.

From the Province of Ontario	$1,818 26
From the Town of Windsor	80 56
From the County of Essex	326 35
From patients themselves for maintenance and treatment	1,830 19
Subscriptions, donations and bequests	76 85
From other sources not enumerated	2,644 99
Total	$6,777 20

Expenditures.

Butchers' meat	$287 41
Butter	193 34
Flour, bread and meal	168 24
Milk	219 58
Tea and coffee	54 58
Potatoes and other vegetables	121 47
Groceries and provisions not enumerated	212 59
Drugs and medicines	222 10
Medical and surgical appliances	63 00
Surgical instruments	......
Beer, wine and spirits	98 50
Bedding, napery and general house furnishings	152 12

Brooms, brushes, mops, soap and cleaning appliances	$129 30
Fuel - - - - - - -	457 50
Light—gas, oil and candles - - - - -	47 18
Water supply - - - - - -	20 00
Hay and straw - - - - - -	100 65
Clothing for patients, including boots and shoes	13 05
Ice - - - - - - -	10 00
Salaries and wages - - - - -	127 81
Taxes and insurance - - - - -	221 04
Contingencies - - - - -	134 27
Repairs ordinary - - - - -	99 24
Total - - - - - -	$3,152 97

Government Grant for 1894.

Allowance for Hospital cases, 4,512 days at 20 cents per day - - - - - - -	$902 40
Supplementary allowance of 10 cents - -	451 20
Allowance for improper cases for Hospital treatment, 1,651 days at 7 cents - - - - -	115 57
Total - - - - - -	$1,469 17

INSPECTIONS.

An inspection of the Hotel Dieu Hospital, Windsor, was made by me on the 7th July. There were 15 patients in residence—4 men and 11 women. Eight deaths have occurred during the year.

There were six old people in the Hospital on the day of my visit who should be in an old people's home. The Hospital authorities are arranging for a department for old people, and when completed those just mentioned will be provided for there. In the meantime they are not to be entered upon the returns as hospital patients.

All departments of the Institution were clean and in good order and the books well kept.

I instructed Mr. Aikens to make the second inspection of this Hospital. A copy of his report is annexed:

In compliance with your request I made the second inspection of the Hotel Dieu Hospital, Windsor, on October 5th. The patients then consisted of nine males, 15 females and one child, total 15. Since your last visit to Windsor the sisters in charge of this Institution have deemed it advisable to abandon the orphanage in connection, which now stands empty, and devote their attention and means to hospital work exclusively. In consequence of this no report will appear from April for any orphanage work.

This Hospital is somewhat unique in structure. Spacious rooms and halls and lofty ceilings is the rule all through the building. For the limited number of inmates the problem of heating such a building is quite an important question, and the sisters admit that a mistake has been made in having such immense private wards to heat and furnish, although in summer the building can always be kept comfortable. I examined the records of the Hospital and found them complete to the end of September.

ST. JOSEPH'S HOSPITAL, CHATHAM.

The following summaries show the operations of this Hospital during the official year :

Movements of Patients.

Number under treatment, 1st October, 1893	5	
Admitted	130	
Births in Hospital	..	
Total number under treatment		135
Discharged	114	
Died	8	
Under treatment, 30th September, 1894	13	
		135

Places Received From.

From the Town of Chatham	71	
From the County of Kent	33	
From other counties of the Province	31	
From the United States	..	
From other countries	..	
		135

Sex.

Male	57	
Female	78	
		135

Religious Denominations.

Protestant	40	
Catholic	95	
		135

Nationalities.

Canadian	104	
English	6	
Irish	9	
Scotch	5	
United States	11	
Other countries	..	
		135

The following table gives a summary of certain cases treated in the St. Joseph's Hospital, Chatham, during the year :

	No. of cases treated.
Typhoid fever	3
Typhus fever	..
Puerperal fever	..
Cerebro spinal fever	..
Diphtheria	..
Smallpox	..

Revenue.

From the Province of Ontario - - - -	$1,193 04
From the Town of Chatham - - -	18 94
From the County of Kent - - - - -	103 93
From patients for maintenance and treatment -	1,167 17
From subscriptions, donations and bequests from private individuals - - - -	......
From other sources - - -	489 50
Total - - - - - - -	$2 972 58

Expenditures.

Butchers' meat - - - - -	$350 76
Butter - - - - - -	90 89
Flour, bread and meal - - - -	150 00
Milk - - - - - - -	175 00
Tea and coffee - - - - -	85 00
Potatoes and other vegetables - - -	60 19
Groceries and provisions not enumerated - -	386 75
Drugs and medicines - - - -	144 00
Medical and surgical appliances - - -	90 00
Beer, wine and spirits - - - -	100 00
Bedding, napery and general house furnishings -	150 45
Brooms, brushes, mops, soap and cleaning appliances -	50 50
Fuel - - - - - -	400 50
Light—gas, oil and candles - - - -	150 00
Water - - - - - -	60 00
Hay and straw - - - - -	......
Clothing for patients - - - -	......
Ice supply - - - - - -	20 00
Salaries and wages - - - -	200 00
Taxes and insurance - - - - -	90 00
Contingencies - - - - -	......
Coffins and funerals - - - - -	......
Repairs, ordinary - - - - -	......
Total - - - - - -	$2,754 64

Government Grant for 1894.

Allowance for Hospital cases, 3,484 days at 20 cents	$696 80
Supplementary allowance at 10 cents - -	348 40
Allowance for improper cases for Hospital treatment, 392 days at 7 cents - - -	27 44
Total - - - - - -	$1,072 64

INSPECTIONS.

This Hospital was inspected by me on the 6th July, when there were six patients under treatment. The register showed that ninety-seven persons had been received since the 1st October, and six had died.

I found no change in the building or premises since my last visit. All departments were clean and in good order, and the books were properly kept.

I instructed Mr. Aikens to make the second inspection of this Hospital; a copy of his report is annexed:

I visited St. Joseph's Hospital, Chatham, to make the second inspection, on October 6th. The building then contained 15 patients. This Institution cost in the neighborhood of $25,000, has accommodation for 46 patients, has three acres of land attached, and is at present managed by a staff of six sisters, besides the daily attendance of the city physicians. The interior appointments were in every way first-class, with the one exception that the majority of the bed frames are of wood. The yards and lawns were neat and inviting in their autumn green.

I looked over the Hospital register and daily record of patients, and saw that daily attention had been given to them.

GENERAL HOSPITAL, STRATFORD.

The following summaries show the operations of the Hospital during the official year:

Movements of Patients.

Number under treatment, 1st October, 1893	13	
Admitted	164	
Number of births during the year	6	
Total number under treatment		183
Discharged	149	
Died	6	
Under treatment, 30th September, 1894	28	
		183

Places Received From.

From the City of Stratford	122	
From the County of Perth	52	
From other counties in the Province	9	
From the United States	..	
From other countries	..	
		183

Sex.

Male	90	
Female	93	
		183

Nationalities.

Canadian	131	
English	27	
Irish	12	
Scotch	10	
United States	..	
Other countries	3	
		183

Religious Denominations.

Protestant	165	
Roman Catholic	18	
Other religions	..	
		183

The following table gives a summary of certain diseases treated in the General Hospital, Stratford, during the year:

	No. of cases treated.
Typhoid fever	41
Typhus fever	..
Puerperal fever	..
Cerebro spinal fever	..
Diphtheria	..
Smallpox	..

Revenue.

Received from the Province of Ontario	$1,223 40
From the City of Stratford	1,000 00
From the County of Perth	300 00
From paying patients	2,388 14
Subscriptions, donations, etc.	1,697 46
From sources not enumerated	25 00
Total	$6,634 00

Expenditures.

Butchers' meat	$336 98
Butter	171 32
Flour, bread and meal	161 82
Milk	135 00
Tea and coffee	79 87
Potatoes and other vegetables	65 32
Groceries and provisions not enumerated	498 78
Drugs and medicines	337 07
Surgical instruments and appliances	152 78
Beer, wine and spirits	106 75
Bedding, napery and general house furnishings	394 97
Brooms, brushes, mops, etc.	25 65
Fuel	769 35
Light—gas, oil and candles	125 35
Water supply	50 00

Hay and straw	$47 83
Clothing	6 00
Ice	10 00
Salaries and wages	1,345 00
Taxes and insurance, rent and interest	44 00
Contingencies	397 09
Repairs, ordinary	28 24
Total	$5,289 17

Government Grant for 1894.

Allowance for Hospital cases, 6,335 days at 20 cents	$1,267 00
Supplementary allowance, at 10 cents	633 50
Allowance for improper cases for Hospital treatment, 650 days, at 7 cents	45 50
Total	$1,946 00

INSPECTIONS.

I made an official visit to this Hospital on the 23rd January. There were then under treatment 12 men and 9 women. The number admitted since the 1st October was 45; no deaths.

I found the public wards and private rooms clean and in good order; also the water-closets, bath-rooms, wash-rooms, dispensary, etc., in a well kept condition.

There is a good staff of doctors and nurses in attendance. The books are properly kept.

I instructed Mr. Aikens to make an inspection of this Hospital. A copy of his report is annexed:

I made the second inspection of the General Hospital at Stratford on July 31st. This Institution is very finely situated on rising ground, which commands a splendid view of the city and surrounding country, and at the same time affords good drainage facilities. The Hospital is well ventilated, and supplied with water, both from the city and from a private well.

It has accommodation for 32 patients, although only 18 were under treatment on the day of my visit. Upon looking back over the register I found that since its opening it has gradually grown in popularity among the sick of Perth county and vicinity.

It has good equipments for hospital work, and is excellently conducted throughout by the lady superintendent and 7 regular nurses. In addition to the present accommodation, there is a large, roomy ward at present only partially used that can be furnished and set apart either as a public or private ward for patients. The superintendent reports a prosperous year and the Institution in easy circumstances. The building throughout was well kept up, and everything in connection therewith indicated a high degree of efficiency.

I inspected this Hospital on the 26th October. There were 43 patients under treatment, namely, 14 men, 17 women and 2 children.

The matron being absent, I was unable to see the books and satisfy myself as to their correctness.

The public wards and private rooms, kitchen, laundry, etc., were all in nice order. The Hospital is well supplied with medical men and nurses.

AMASA WOOD HOSPITAL, ST. THOMAS.

The following summaries show the operations of this Hospital during the official year:

Movements of Patients.

Number under treatment, 1st October, 1893	8	
Admitted	138	
Births in the Hospital	1	
Total number under treatment		147
Discharged	129	
Died	8	
Under treatment, 30th September, 1894	10	
		147

Places Received From.

From the City of St. Thomas, including births in Hospital	116	
From the County of Elgin	27	
From other counties in the Province	4	
From the United States	....	
From other countries	....	
		147

Sex.

Male	147	
Female	....	
		147

Nationalities.

Canadian	90	
English	30	
Irish	8	
Scotch	7	
United States	8	
Other countries	4	
		147

Religious Denominations.

Protestant	138	
Roman Catholic	7	
Other religions	2	
		147

The following table gives a summary of certain diseases treated during the year :

	Number of cases treated.
Typhoid fever	10
Typhus "	..
Puerperal "	..
Cerebro spinal fever	..
Diphtheria	..
Smallpox	..

Revenue.

From the Province of Ontario	$329 93
From the City of St. Thomas	2,000 00
From the County of Elgin	....
From other sources	51 00
From other municipalities in the Province	....
From paying patients themselves	1,095 20
Total	$3,476 13

Expenditures.

Butchers' meat	226 00
Butter	136 56
Flour, bread and meal	75 60
Milk	105 00
Tea and coffee	9 90
Potatoes and other vegetables	36 07
Groceries and other provisions not enumerated	251 35
Drugs and medicines	93 03
Surgical instruments	39 59
Beer, wine and spirits	9 45
Bedding, etc.	52 35
Brooms, brushes, mops, soap and cleansing appliances	15 15
Fuel	403 55
Light—gas, oil and candles	142 26
Water supply	21 24
Training school books	47 75
Clothing for patients, including boots and shoes	....
Ice	18 00
Salaries and wages	1,125 50
Taxes and insurance	40 13
Coffins and funerals	....
Contingencies	65 00
Repairs, ordinary	49 72
Total	$2,963 20

Government Grant for 1894.

Allowance for Hospital cases, 2,734 days at 20 cents -	$546 80
Supplementary allowance at 10 cents - -	273 40
Allowance for improper cases for Hospital treatment, 54 days at 7 cents - - - - - -	3 78
Total - - - - - -	$823 98

Inspections.

I made an inspection of this Hospital on the 26th January.

There were then four male and four female patients under treatment. The admissions since the 1st October were 42, and deaths 4. I found no change in the building or premises since my last visit. All the public and private rooms were in good order, and every arrangement made for the comfort and well-being of the patients.

In establishing this Hospital Mr. Amasa Wood has conferred a great blessing upon the city of St. Thomas.

I again visited this Hospital on the 27th November. The patients under treatment on that day were 3 men and 6 women. The admissions during the past year were 140, and the deaths 7. There is no change in the building or grounds to report since my last inspection.

Mr. Amasa Wood has lately presented the Hospital and the city with a very fine ambulance to be used in conveying the sick to Hospital.

The dispensary, operating-room, bath-rooms, water-closets, etc., were all in good order.

There is a good medical staff and efficient nursing. The books are well kept. The management is under the direction of the superintendent, Miss Pollard.

GENERAL AND MARINE HOSPITAL, OWEN SOUND.

The following summaries show the operations of this Hospital during the official year :

Movements of Patients.

Number under treatment, 1st October, 1893	7	
Admitted	59	
Births in Hospital	2	
Total number under treatment		68
Discharged	57	
Died	6	
Under treatment, 30th September, 1894	5	
		68

Places Admitted From.

From the Town of Owen Sound	48	
From the County of Grey	16	
From other counties in the Province and sailors	4	
From the United States	..	
From other countries	..	
		68

Sex.

Male	34	
Female	34	
		68

Nationalities.

Canadian	46	
English	7	
Irish	3	
Scotch	5	
United States	4	
Other countries	3	
		68

Religious Denominations.

Protestant	61	
Roman Catholic	7	
Other religions, or not known	....	
		68

The following table gives a summary of certain diseases treated in the General and Marine Hospital, during the year:

	No. of cases treated.
Typhoid fever	10
Typhus "	..
Puerperal "	..
Cerebro spinal fever	..
Diphtheria	..
Smallpox	..

Revenue.

From the Province of Ontario	$ 78 00
From the Dominion Government	....
From the Town of Owen Sound	80 16
From the County of Grey	....
From other municipalities	11 50
From patients themselves for maintenance and treatment	655 81
From endowments, investments or other property belonging to the Hospital	....
From subscriptions, bequests and donations of private persons	915 96
From all other sources not enumerated	72 82
Total	$1,814 25

Expenditures.

Butchers' meat	97 54
Butter	74 57
Flour, bread and meal	54 70
Milk	103 35
Tea and coffee	21 00
Potatoes and other vegetables	26 65
Groceries and provisions, not enumerated	177 45
Drugs and medicines	56 91
Medical and surgical appliances	....
Surgical instruments	....
Beer, wine and spirits	55 45
Bedding, napery and general house furnishings	12 30
Brooms, brushes, mops, soap and cleaning appliances	10 75
Fuel	262 75
Light—oil and candles	15 10
Water supply	....
Hay and straw	....
Clothing for patients	....
Ice	9 80
Salaries and wages	674 36
Insurance and interest	43 30
Contingencies	39 88
Stationery, advertising, printing, postage, etc.	....
Repairs, ordinary	35 65
Total	$1,771 51

Government Grant for 1894.

Allowance for Hospital cases, 1,814 days at 20 cents	$362 80
Supplementary allowance at 10 cents - -	181 40
Allowance for improper cases for Hospital treatment, 85 days at 7 cents - - - -	5 95
Total - - - - - -	$550 15

INSPECTIONS.

I made an inspection of the General and Marine Hospital, Owen Sound, on the 9th August.

There was only one patient, a female, under treatment on that day. The admissions since the 1st October numbered 51, and the deaths 6.

All the different departments were clean and in good order, and there is a good staff of nurses and medical men.

The drains from the Hospital are connected with the town system. A sidewalk requires to be laid up to the Hospital, and the grounds levelled.

There are also some details in the building that should be furnished, such as shelving in the basement, fixtures to the windows, and the traps to the water-closets need repairing.

I visited this Hospital on the 21st November, and saw the patients, three men and four women, then under treatment. During the year the admissions were 84, and the deaths 5.

I found the Hospital in excellent order from basement to attic.

There is a good staff of medical men in attendance, and a sufficient number of nurses.

The Institution is well managed, and the books are properly kept.

GENERAL HOSPITAL, CHATHAM.

The following summaries show the operations of this Hospital during the official year:

Movements of Patients.

Number under treatment, 1st October, 1893	1	
Admitted	207	
Births in Hospital	2	
Total number under treatment		210
Discharged	183	
Died	16	
Under treatment, 30th September, 1894	11	
		210

Places Received From.

From the Town of Chatham	100	
From the County of Kent	95	
From other counties of the Province	5	
From the United States	10	
From other countries	....	
		210

Sex.

Male	98	
Female	112	
		210

Religious Denominations.

Protestant	208	
Roman Catholic	2	
		210

Nationalities.

Canadian	165	
English	21	
Irish	7	
Scotch	7	
United States	10	
Other countries	....	
		210

The following gives a summary of certain cases treated in the Hospital during the year:

	No. of cases treated.
Typhoid fever	30
Typhus "	..
Puerperal "	1
Cerebro spinal fever	..
Diphtheria	1
Smallpox	..

Revenue.

From the Province	....
From the Town of Chatham	$213 50
From the County of Kent	75 00
From patients themselves for maintenance and treatment	1,856 00
From property belonging to the Hospital	....
From subscriptions, donations and bequests from private individuals	935 73
From all other sources	....
Total	$3,080 23

Expenditures.

Butchers' meat	$195 98
Butter	77 22
Flour, bread and meal	68 00
Milk	130 00
Tea and coffee	30 25
Potatoes and other vegetables	90 00
Groceries and provisions, not enumerated	320 18
Drugs and medicines	68 78
Surgical instruments and appliances	36 59
Beer, wine and spirits	7 87
Bedding, napery and general house furnishings	531 47
Brooms, brushes, mops, soap and cleaning appliances	29 00
Fuel	330 79
Light—gas, oil and candles	126 00
Water supply	44 00
Clothing for patients	....
Ice	15 00
Salaries and wages	690 00
Taxes and insurance	....
Coffins and funerals	....
Contingencies	....
Repairs, ordinary	10 00
Total	$2,801 13

Government Grant for 1894.

Allowance for Hospital cases, 5,066 days at 20 cents per day - - - - -	$1,013 20
Supplementary allowance, at 10 cents - -	506 60
Allowance for improper cases for Hospital treatment, 246 days at 7 cents per day - -	17 22
Total - - - - - -	$1,537 02

INSPECTIONS.

I visited this Hospital on the 6th July, and found 8 patients in residence. The admissions since the 1st October last were 75, and the deaths 6.

The public wards and the private rooms were all clean and in good order; also the dining-rooms, operating-room, dispensary, bath-rooms and water-closets. There are no outbuildings on the grounds.

The Hospital is heated with steam, lighted with gas, and provided with water from the town system.

There is a good medical and nursing staff.

I instructed Mr. Aikens to make a second inspection of this Hospital. A copy of his report is annexed:

The General Hospital at Chatham was inspected the second time, upon your request, by me on October 6th. I found a number of typhoid fever cases in the building. It seems that at this season of the year the town has a regular epidemic of this kind. On account of its prevalence one of the attendants has invented a fever bath-tub, which has been found very useful in treating this disease. The general equipment of this Hospital is quite complete. Four nurses besides the matron are in constant attendance Thirteen patients were being treated on the day of my inspection, all of whom I saw. The Hospital is well situated for drainage purposes, but sometimes a lack of water pressure is experienced in the top storey. The daily record and other books. after examination, were found to be systematically entered.

TWENTY-THIRD ANNUAL REPORT

OF THE

INSPECTOR OF PRISONS AND PUBLIC CHARITIES

UPON THE

ONTARIO INSTITUTION

FOR THE

EDUCATION OF THE BLIND

BRANTFORD

BEING FOR THE YEAR ENDING 30TH SEPTEMBER

1894.

PRINTED BY ORDER OF THE LEGISLATIVE ASSEMBLY

TORONTO:
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1895.

OFFICE OF THE
INSPECTOR OF PRISONS AND PUBLIC CHARITIES, ONTARIO,
PARLIAMENT BUILDINGS, TORONTO, November, 1894.

SIR,—I beg to transmit herewith the Twenty-third Annual Report upon the Institution for the Instruction and Education of the Blind, at Brantford, for the year ending 30th September, 1894.

I have the honor to be, Sir,
Your obedient servant,

T. F. CHAMBERLAIN,
Inspector.

THE HONORABLE J. M. GIBSON, M.P.P.,
Provincial Secretary.

PROVINCE OF ONTARIO INSTITUTION FOR THE EDUCATION OF THE BLIND, BRANTFORD.

TWENTY-THIRD ANNUAL REPORT

OF THE

INSPECTOR OF PRISONS AND PUBLIC CHARITIES

OF THE

PROVINCE OF ONTARIO.

PARLIAMENT BUILDINGS,
TORONTO, November, 1894.

To the Honorable GEORGE AIREY KIRKPATRICK, *Lieutenant-Governor of the Province of Ontario.*

MAY IT PLEASE YOUR HONOR:

I have the honor to submit herewith the twenty-third Annual Report upon the Institution for the Education of the Blind at Brantford, for the year ending 30th September, 1894.

I have the honor to be,
Your Honor's most obedient servant,

T. F. CHAMBERLAIN,
Inspector.

ONTARIO INSTITUTION FOR THE BLIND, BRANTFORD.

CONTENTS.

THE INSTITUTION

FOR THE

EDUCATION OF THE BLIND.

In my report last year I called attention to the number and condition of the blind in this province as compared with the other provinces in the Dominion of Canada, and gave statistics as to the number in the Dominion, how they were distributed, their religion, sex, employments, proportion to the population, etc.; also figures showing that the unfortunate affliction of blindness is on the decrease and the conditions which have contributed to that end.

The very extensive report of the Principal, Mr. Dymond, for the past year renders any lengthy remarks on this Institution by me unnecessary. A careful perusal of his report will prove interesting to those who take an interest in the education of the blind.

The literary work of the Institution is fully reported upon by the examiners, Messrs. Kelly and Wilkinson.

The examination in the musical department was again made by Professor Ambrose, and the result will be found in his report.

There is also a lengthy report from Mr. Truss, the instructor in the willow-work department.

The health of the pupils in the Institution during the past year has been fairly good, as will be noticed by the report of the attending physician, Dr. Marquis.

Dr. Osborne, oculist, made an examination of the children's eyes during the past year, and has given a full report and classification of the diseases causing their total or partial blindness.

For the year ending 30th September, 1894, there were 150 pupils in attendance—84 males and 66 females—the number being a little less than in preceding years. But few changes have taken place in the teaching staff of the various departments during the year. I find that the proficiency attained by the pupils engaged in piano-tuning is not up to the standard which I should like to see. Two or three lessons a week during the short time of their attendance at the Institution are not sufficient to enable the pupils to acquire that knowledge of tuning which they ought to have to qualify them for following the business. While it is true that many of the graduates have attained to a high degree of efficiency and have been generally successful in their avocation, more speedy and better results would be assured by a close oversight of the pupils by a resident instructor. Also more additional appliances for imparting a more practical knowledge of the mechanical branch of the work are much needed.

During the year the class rooms have been much improved with new flooring and desks and other improvements have been made to the building and grounds.

A new barn and a cow stable have been erected. The products of the farm have been fairly good.

The officers and teachers have taken every interest in the work of preparing the pupils for active and useful lives after leaving the Institution.

The reports made of my official visits and inspections are appended, and I have to thank the Principal, Mr. Dymond, officers and teachers for their kindness and courtesy to me during those visits.

INSPECTIONS.

I made my first inspection of this Institution for the current year on the 13th January, and found all the departments in a clean and well-kept condition. The dormitories, dining-rooms, class rooms, and chapel have been thoroughly renovated during the year.

The pupils were seen in their classes, and the teachers in charge—from the kindergarten class to the highest class of advanced pupils—showed very great interest in their work.

Those female pupils showing an aptitude for industrial work were being taught sewing, knitting, and fancy work. In the willow-work shop a number of the boys were engaged in basket and willow furniture making, under the direction of Mr. Truss. The sales from this shop go towards buying material and providing outfits for graduates when leaving the Institution.

The boys who are learning piano-tuning receive instruction two days each week. I am of the opinion that a practical resident instructor should be employed in training those who intend to follow piano-tuning and repairing for a livelihood, as the present arrangement, limiting the instruction to two days per week, is hardly sufficient to secure proficiency in the work within a reasonable time of residence.

The inmates were all well.

The Bursar's office was in good order, and the books written up. The general management of the Institution was satisfactory.

A barn is very much required on the premises for storing farm produce and housing stock.

I again visited the Institution for the Blind, Brantford, on the 25th October, when there were 129 pupils in the several classes—viz., 60 girls and 69 boys, all of whom were enjoying good health.

The general condition of the buildings and grounds was very satisfactory. Considerable work was done during the summer in repairing the class-rooms and dormitories, relaying floors, etc.

New desks have been placed in the class-rooms and new bedsteads in the boys' dormitories.

Some new instruments have been added to the musical department, and an electric motor for running the organ has been put in.

A new heating boiler has been put in.

A new barn has been built, and the outbuildings generally improved.

All the different departments, school-rooms, dining-rooms, dormitories, teachers' rooms, working-rooms, wash-rooms, etc., were in good condition.

Work in the willow-shop has been making good progress, some of the pupils taking a great interest in learning the trade.

The produce of the farm was fairly good this season, and the stock was in good order.

The offices of the Principal and Bursar were in perfect order.

The teachers appear to take a great deal of interest in their work. In addition to literary work music is taught, and a number of pupils are taught piano-tuning. The smaller children have a kindergarten department.

The gymnasium is complete, and very much enjoyed by the pupils, who spend an hour or two daily in physical training.

There have been some changes in the teaching staff during the year. One of the teachers, Mr. Padden, who was so long disabled by his broken arm, has quite recovered.

REPORT OF THE PRINCIPAL.

Ontario Institution for the Education of the Blind.

Brantford, Oct. 1, 1894.

T. F. Chamberlain, Esq., M. D.
Inspector of Public Institutions.

Sir,—I have the honor to submit my report for the year ending Sept. 30th, 1894.

It has been my practice hitherto to confine myself to a concise presentation of statistics with a running commentary on the routine work of the Institution. On this occasion I propose to preface the usual details with a few remarks on the nature and objects of the Institution, the character and quality of the instruction given, and the economical aspects of its management.

Public Criticism.

It is clear that some persons to whose wishes and enquiries I am bound to pay deference desire information in these regards. For twenty-two years the Institution has scarcely been touched by the shafts of criticism. Its supplies have been voted from session to session with barely a remark. Only very occasionally has some wandering and wondering legislator been found within its walls. A humane sentiment has pervaded the public mind and stilled even the troubled, and sometimes troublesome soul of the financial critic. To anglicize a well-known French proverb, to begin to excuse is to suggest there is cause for accusation. There has, up to a few months since, been no attack, and so attempts at defence would have been only suggestive of an unquiet conscience.

But recently the situation has somewhat changed. The exciting influence of a general election has been felt even here. Preceding and during the contest both in the legislature and on public platforms the Institution for the blind has received attention. No one has any right to complain of this; least of all those who have a good answer to adverse, although in our case, as a rule, I am bound to say by no means unkindly—comments. Writing nearly the same story year after year is not a very cheerful duty. A little opposition gives spice and purpose to the task, and, in my experience, it often does good rather than harm to the subject of attack, especially where the defendant has the right of reply. Now the suggestion,—I believe they have hardly been formulated as charges—are, so far as I understand them, nearly as follows:

1. That the educational work of the Institution is not up to the proper standard of efficiency.

2. That the industries taught are not those best adapted to the needs of the blind.

3. That the staff of instructors and employees is larger than it ought to be.

4. That the cost of maintenance is too great.

All which, it must be admitted, are most legitimate subjects for enquiry and discussion.

Objects of the Institution.

This Institution has been established to give to those young people of Ontario who, by reason of blindness or impaired vision, cannot be educated in the public schools, an education as nearly as possible equal to that which the public schools supply to the sighted; and the first question that will be asked will be, what are the qualifications of those by whom knowledge is imparted to the blind scholars?

The Literary Staff.

We have (exclusive of the Kindergarten Directress) four (two male and two female) literary teachers. I believe one of the statements to which currency was given in or out of the Legislature was that the senior master was the holder of only a third-class certificate. No teacher of this Institution for years has taught on a third class certificate. The officer in question never held a third-class certificate. He taught originally, for he is now a man of mature age and experience, on one of the old county certificates. Under the new system he took an excellent second class, taught in various schools in the States and Ontario, had been appointed head master of one of the large ward schools in Brantford, and had been teaching in the Collegiate Institute in this city, when, a vacancy suddenly occurring through the death of the then senior male teacher, he was selected unhesitatingly by the former Principal, J. Howard Hunter, M.A., himself a distinguished educationist, and, on that gentleman's recommendation, appointed to the position he has now held with honor to himself and benefit to the Institution for eighteen years. Mr. Wickens has been not only a teacher but a student and reader. I will venture to say that, for general and useful information on all educational subjects he has few superiors. It would have been easy for him to have taken a first-class certificate and he would have done so, but it was deemed best, in the interest of his new work, he should devote his whole energies to the blind educational methods. In these he is an adept.

The other male literary teacher of last session held a second-class certificate and was head of a public school when he came to us. His successor, just appointed, also has a second-class, has taught for eight years, and comes from the position of head of a large public school with the highest testimonials as to his competence and ability in the actual work of teaching.

The two lady literary teachers have both been with us for just eleven years. One of them holds a first-class Normal school certificate, and had a thorough experience as a public school teacher before accepting her present appointment. The other lady had her earliest training as a teacher in Brantford. She came, by steady promotion, to be the head of the senior division of the great Central school here; quitted that post for that of

English teacher in the Port Hope Collegiate Institute (one opening of the kind out of several that awaited her choice) and was preparing pupils for matriculation when appointed to her present situation. I think, therefore, I have established conclusively that the quality and standing of our teaching staff is sufficiently high for any reasonable demands upon it. Certainly it is equal to anything required by the public schools, while we are able to grapple, if necessary, with all grades up to matriculation for the University.

On this point I draw your attention to the Examiners' opinion. Of those officials I will say something presently. The Examiners say in their appended report: "Of the efficiency of the teaching staff in the literary subjects little need be said. They are thoroughly capable instructors, all holding Provincial certificates, none lower than the second-class grade, and all successful public, or public and high school teachers. Of the thoroughness of their work the results of the examinations for years back afford the best evidences."

The Examiners of the Literary Classes.

Previous to my appointment as Principal no independent examinations were held. It was not my good fortune to be like my able predecessor, an educationist by profession. I welcomed therefore, with no small pleasure, the decision of the department that annual examinations should be the rule in future. The gentlemen selected, and who have ever since discharged the duty, were: Dr. Kelly, Public School Inspector of Brant County and Mr. Wm. Wilkinson, M. A., Principal of the Brantford city schools. Dr. Kelly is one of the oldest public school inspectors. Mr. Wilkinson has been twenty-two years in his present position. I think he has some nine hundred pupils under his immediate charge in the Central school. Both, consequently, are most competent judges of teachers, of the progress of the pupils, of the organization of a school, and of the instruction imparted. They spend three days annually in the Institution, examine every pupil in the literary classes, and assign to each his or her due percentage of marks, 100 being in all cases the maximum. Their advice is sought, too, on any subject connected with the curriculum of study where it is likely to be helpful. I refer any one sufficiently interested to peruse it, to the Examiners' report. It should, I think, satisfy every impartial mind (1) that the instruction imparted is equal to the pupils' needs; (2) that what is taught is taught thoroughly. The Examiners, whose opinion on the latter point has been already quoted, remark as to the former: "In our opinion the curriculum as it now stands is sufficiently extensive." The Examiners say elsewhere: "Except in the single department of mathematics (for experimental science is out of the question here) the pupils of the higher classes are the peers of those in the higher forms of the public, and the lower forms of the high schools. In subjects depending chiefly on memory they are probably better." By reference to the report of the examination of the highest arithmetic class the last statement will be verified. After paying a high tribute to its teacher's efficiency, the examiner says: "The average of a class of 13 was 78 per cent. in a set of 14 questions comprising examples in analysis, percentage, commission, taxation, interest, mensuration, partnership, and the application of proportion and some other rules. The problems were solved quickly and in a concise manner, showing a thorough understanding of the matter. That there had been no rote teaching was abundantly evident from the work done and the way in which they did it."

Higher Education.

I have gone thus fully into the literary class work of the Institution because, as I showed at the commencement, that is the primary object of its existence. It may be asked whether we are contented to stop here, whether we cannot lift our pupils to a higher educational level, enable them to accomplish greater achievements in the literary field? This is done sometimes elsewhere; why not here? My answer is, that we have wrestled with higher education and are prepared to wrestle with it again; to prepare pupils for matriculation if desired. But (1) it is only at intervals and in rare instances that such a demand is made upon us; and (2) the chances of the ordinary blind youth in any one of the professions are so limited it would be unwise to encourage an ambition that is only likely to lead to disappointment. The question is not what can a blind youth be taught, for he can be taught, I admit, (given good abilities) nearly anything, but what can he successfully adopt as a means of livelihood when taught? The medical profession is out of the question; as a teacher in the public or high schools a blind applicant would stand no chance at all, even although he had, by great efforts, secured a certificate; a blind man may pass his legal examinations and be called to the bar, but there the real difficulties begin, and are, I fear, insuperable. So far as my information goes a career founded on literary attainments only has in Ontario in most, if not all cases, resulted in disappointment. There is one profession, however, the sacred ministry, in which a young man duly called and gifted, although blind, might, I believe, succeed. I have more than once brought this subject before the minds of pupils. No one has yet responded to the suggestion. It is obviously a subject not to be pressed too hastily or urgently. Should any pupil show a leaning in that direction he will have every needful assistance in accomplishing his object. Meantime let me say, once for all, that it is the practical, not the merely showy or ornamental we propose here to aim at. What we do is honest work for an attainable purpose. Our achievements may be humble compared with some lofty ideals, but we have no toleration or place for shams.

The Kindergarten.

This may be regarded as a preparatory branch of the literary department. Its directress holds a certificate from the Normal Training School at Toronto. The work of the blind pupils has stood the test of competition and comparison at the World's Fair and elsewhere, with that of any sighted exhibits.

The Musical Department.

Arising naturally out of the desire to make their lives cheerful, to give employment to leisure in a delightful pursuit, to provide an avocation for the more talented, a department of musical instruction has been created. It is sometimes imagined that, because so many blind persons resort to music, the blind are specially musical. This is a delusion. But, doubtless, even if not gifted with the musical talent in an especial sense, a blind boy or girl will seize hold of music when a sighted one, otherwise occupied, would pass it by. For those who have the talent, music is unquestionably the hope and sheet anchor. There is nothing to prevent a blind person attaining the highest place as a musician. Blind teachers, if they are really able, compete on a very fair footing with sighted ones; hence the liberal and costly outlay under this head—are the results satisfactory? Now, here let me say, as I may have to repeat, no education or instruction will overcome all personal or mental defects. To these, too many failures in both musical and industrial avocations must be attributed. In teaching especially, address, deportment, a ready adaptability to circumstances are of the first importance. One with less than the highest gifts, may, with these, succeed; the brightest musical genius without them, may, as a teacher, fail. I have before me some melancholy illustrations of this truth. On the other hand not a few of our former pupils are doing well in this connection.

The Music Staff.

We have four, one male and three female, music teachers. The former is head of the music staff. His special duties are instruction in the pipe organ, pianoforte, and vocal music. This gentleman is an associate of the College of Music (England); holds first-class certificates for music in the Society of Arts (England); and is also an associate of the Canadian College of Organists. All these are proofs of a thorough musical education, hard study and professional culture. The lady teacher standing next in order takes the highest class in counterpoint, harmony and the theory of music, as well as the senior female pupils on the pianoforte. She has successfully passed two out of the three examinations requisite to receive the degree of Bachelor of Music from Trinity University, and, having taken a course in the Conservatory of Music, Toronto, will claim its diploma in June next. Degrees and diplomas in music are a comparatively recent experience in Ontario. The two ladies not yet specifically referred to have been respectively engaged in their profession for fifteen years or over. They hold no degrees or diplomas, but lack for nothing necessary to make the painstaking, thorough and successful teacher.

Musical Examinations.

In this department, as in the literary classes, there is an annual examination. The examiner, for several years, has been Professor R. S. Ambrose, of Hamilton. He is one of the oldest and best known music teachers in the Province. Hundreds of his former pupils can testify to his ability, and above all to his thoroughness. Professor Ambrose devotes two days to the individual examination of the pupils in instrumental music and to the collective efforts of the vocal classes. He also advises us generally as to the curriculum, and any other matters bearing on the work.

Quality of the Work.

The quality of the work done is attested by the examiner's report. In counterpoint, on papers founded on Dr. Bridge's Canto Fermos, the markings of the first class last June averaged 94 per cent., and in harmony (Prout's exercises) they were equally successful. The second class, examined on exercises from Emery's Elements of Harmony, made an average of 63 5 per cent. The character of the instruction given in the above studies, as well as in the pipe organ, has been demonstrated by the fact that, within the last three years two of our male pupils have graduated as associates of the Canadian College of Organists, after a pretty severe examination in both theory and execution. One of these young men received the highest marks in theory of the whole number examined. Such men as S. P. Warren, of New York, or Messrs. Torrington, W. E. Fairclough, and Vogt, of Toronto, can speak of the quality of the instruction by which our pupils have benefited. Nor were those who thus secured recognized honors, by any means isolated cases of high attainments. Others who, for personal reasons failed to compete, were quite their equals.

Pianoforte pupils are taught according to a regular system of graded studies. By comparing our course of five grades with that of the Toronto College of Music, I find they are nearly identical up to the fifth grade. The fourth grade of the college is the one the student is required to pass before receiving a teacher's certificate. It may be worth while to consider whether we should not adopt, in all its details, the pianoforte course of one or other of the now well-established Toronto schools of music; and also whether, in the future engagements of teachers, a certificate or diploma from a college, indicating the grading of the applicants, should not be required, may also be a question. But, while that may be a means of satisfying the public and answering criticism, it will not provide more solid instruction, or more painstaking instructors than we possess already.

The Industrial Department.

The industrial training of the pupils is, so far as the main object of the institution is concerned, extra-educational. What shall be taught, who shall be taught, whether in fact anything shall be taught not included in the public school curriculum, is entirely discretionary. But, granted that certain industries shall be attached to the pupils' educational training, the question is, what shall they be? As to the female pupils, the propriety of teaching the use of the sewing and knitting machine, and instructing them in hand-sewing and knitting and fancy-work generally, is never disputed. But with regard to male pupils, the question of profitable employment has always been a very perplexing one. People who attempt to give outside advice on this subject, usually only afford additional illustrations of a standing difficulty. Some even, who have a certain experience in the matter, do not help much by their suggestions. At the recent convention of American Educators of the Blind we heard of a pupil who, although totally blind, had developed an extraordinary faculty for clock repairing and locksmithing. That he could pick any lock in the institution was one of the interesting evidences of his talent. Whether that was a desirable tendency to cultivate, might be an open question. This, however, is only one of many isolated instances of the kind that continually come before the educators of the blind. Out of the fifty or sixty youths in the same institution, probably not a second could have been found with the like aptitude. Even such aptitude and handiness need training and teaching in order to make the perfect workman. And it would add alarmingly to the staff of instructors if for every one, or even every few pupils with particular tastes or abilities, a separate instructor had to be secured. The problem to be solved is not, what can an abnormally clever or peculiarly constituted blind youth be taught to do? but, what trade of general utility can a considerable proportion be taught to follow with a reasonable expectation that they will be able to earn a modest living, and compete with sighted labor. This, again, is partly to be decided by locality and local conditions of trade. In the neighborhood of large populous centres, certain trades may be carried on that would be quite out of place in rural districts, from which our pupils largely come.

For the industry and talents of our male pupils, we have hitherto provided two outlets, piano-tuning and the willow and rattan work.

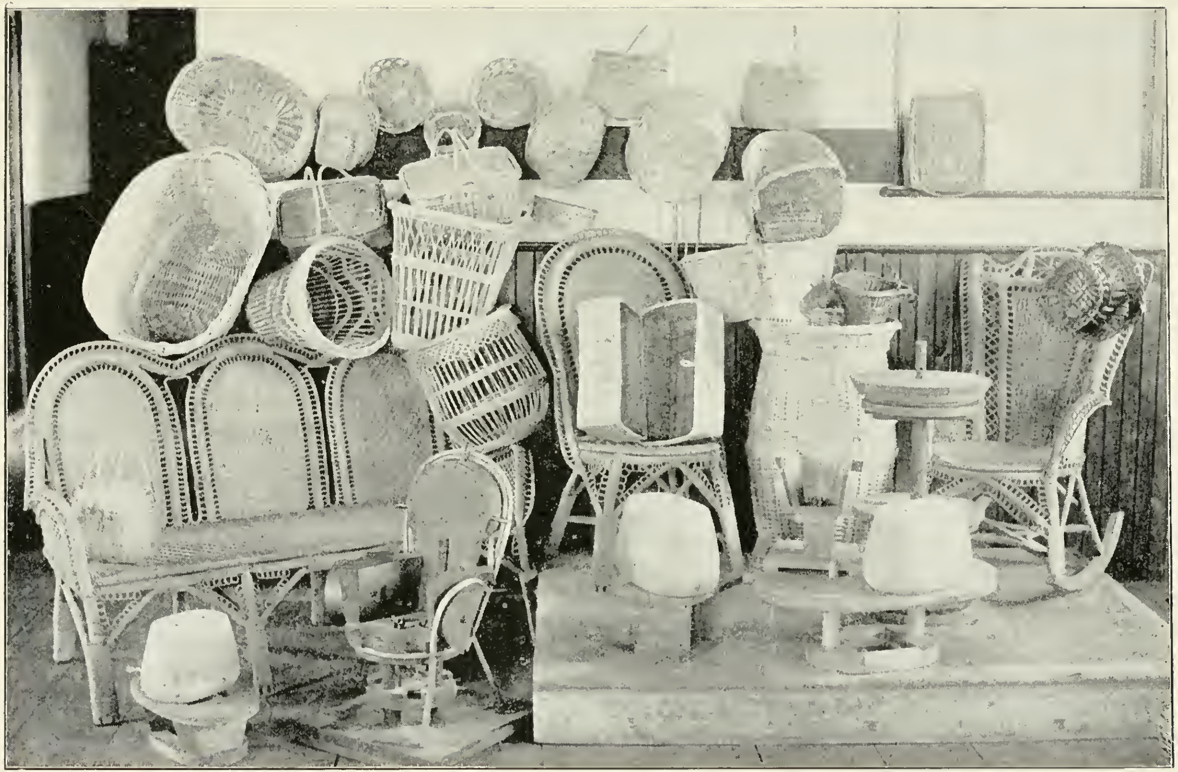
Piano-Tuning.

The depressed state of trade recently has affected the piano business very seriously. Some excellent tuners, former pupils, have, from no fault of their own, been out of employment. But so, too, have been not a few of their sighted fellow craftsmen. As a rule a youth graduating as a piano-tuner, especially if he is so fortunate as to secure a position for a time in a factory, does well. I can point to instances on all hands where either in factories or on their own account, our piano-tuning graduates have succeeded admirably, better, many of them, than they would have done if, as sighted persons, they had followed the perhaps ruder and more laborious calling which, without special training, would alone have been open to them. Our piano-tuning department, however, has grown rapidly into importance out of small beginnings. From four or five specially apt youths to whom as a privilege instruction in piano-tuning was given, we have now a class every session of over twenty. The attendance for a few hours on two days in the week of the instructor is not sufficient. The daily practice should be under skilled supervision. More time is needed for practical instruction in making minor repairs. The study of the piano mechanically is important, and not much time is available for it. The trifling sum now paid to the instructor is not sufficient to secure all we want for the perfect development of this important department. The remedy is a very simple and obvious one.

Willow-Work.

The experience of willow-work graduates has been more varied than has been that of the piano-tuners. But that, I venture to say, has been rather the fault of the men than of the trade. Many of them have been conscious of this. Otherwise we should not have waited over twenty years to be told our experiment had been a failure. No small number have come to us as grown youths or of adult age. Many of these have lost their sight while engaged in rough and unsettled avocations. Some have not previously led the most regular lives. Steady industry and application have been distasteful to such. When the wholesome discipline and restraints of the Institution are removed and the struggle for bread begins, old habits reassert themselves; all is not smooth sailing; restlessness and discouragement supervene; the trade is thrown up, some peripatetic vocation offers apparent advantages; and people who know nothing and sympathize much with a blind man's failure charge his ill success to his trade and not to himself. One case in particular I observed which was noisily proclaimed to be a proof of the willow-work not being suited to the wants of the blind. It was that of a young man with great personal and local advantages had he availed of them and had he possessed the moral stamina required to ensure success anywhere He had thrown up his hands in despair at the end of ten weeks!!! What sighted man ever makes his trade a success in ten weeks?

Our graduates in this branch who may be regarded as successful are of two classes: (1) Those steadily and continuously working at their trade, and (2) those



WILLOW AND RATTAN WORK, BLIND INSTITUTE, BRANTFORD.

whose time is only partially so occupied. The latter form a pretty large percentage of the whole. The majority live as I have said in rural districts. A person even if totally blind can do a great deal of helpful and useful work when accustomed to his local surroundings. And if, in addition to such handiness on the farm or around the homestead, a blind youth can make, say only one hundred dollars a year by his trade, I hold that his time at the Institution has been well spent, and that the effort to instruct him in both its industrial and moral aspects has been more than justified. To pretend, however, that an industrious graduate, under ordinary conditions, choosing a favorable spot for his business, cannot earn a living by the willow trade is proved by the facts to be an absurdity. It is not necessary to encumber this report with personal details, but the facts will be forthcoming whenever required. The means of and reasons for success are quite readily accessible as, too, are the causes of failure. Briefly summarized the advantages of the willow-work trade as an industry for the blind are as follows: (1) The articles made are of great variety and in universal demand; (2) in Canada we have no large factories for such goods competing with the private maker; (3) the goods are easily marketed; (4) the needful arrangements for carrying on the business are of the simplest nature; (5) by the use of blocks and models the blind workman can be placed on an approximate equality with the sighted one; (6) the material can be easily grown or collected, in the country may be raised by the person using it; (7) the cost of the material bears a very small proportion to the manufactured product; (8) it is a trade in which slight defects in the quality or appearance of the goods turned out do not destroy their usefulness, even if the market value be somewhat reduced; (9) it needs no special intelligence, although that quality tells here as well as everywhere else. I know of no other handicraft available by the blind combining so many favorable conditions. And no one has yet ventured to suggest any practicable substitute. In the States corn broom-making is largely followed. Why? Only because no other industry presents itself. Our position in that respect is envied by our *confreres* on the other side. The great factories over there, with a plethora of labor, would swamp the small producer of willow-work. On the other hand I do not believe any one can, in Ontario under ordinary circumstances, as a private manufacturer make brooms at a saleable profit. A very intelligent blind man recently told me he had made 200 dozen brooms as an experiment. The material cost him within a fraction of the price at which the same goods at the Central Prison could be bought ready made. Some enquiries as to mat-making have been attended with similar results. And so with some other trades. Either the local competition is too great; the necessary appliances are too cumbrous; the art is too difficult to be easily acquired; or the market is too distant to meet the necessities of the case of the blind. It is further interesting to know, that at the only other Institution for the Blind in the Dominion on any scale worth mentioning, the one at Halifax, the willow-working is (with the exception of piano-tuning) exclusively taught, and with a large and undeniable measure of success. All other handicrafts have been renounced in its favor.* As I have said already, the industrial employment of the blind is a very perplexing problem. My seniors in the profession by twenty years are not able to solve it satisfactorily. A committee of experienced educators of the blind appointed at the late Biennial Convention is now considering the whole question. Their report will be awaited with interest.

The Number of Teachers, Instructors and Employees.

The number of persons engaged in connection with the Institution has been the subject of remark. This is very natural. (1) It is the one institution maintained by the Government in which those for whom it is carried on do nothing towards the work connected with it. The Asylums, the Central Prison, the Reformatories, the Institution for the Deaf and Dumb can all call on their inmates for help in domestic or other particulars. Here we can profitably do nothing of the kind. All the work of the farm, the grounds, the domestic departments, has to be done by hired help. (2) Not only do the pupils fail to help, but they need in various ways to be helped. We try to teach them to be helpful, but the raw material as it comes to us is too often very helpless indeed. As regards our

* It is stated in a recent report that pupils of this Institution are now being trained as bell-hangers, telephone repairers, etc. We have yet to learn the practical results of this experiment.

particular conditions, too, it will be observed that we produce much which might but for our existing facilities be purchased. The number of names on the pay lists might be reduced so far as some of our hands are concerned, but then the result would be seen in milk bills, bread bills, accounts for all sorts of odd jobs and repairs or apparatus now represented by the carpenters' wages, and so forth. I have no hesitation in saying that the Institution would lose financially and in other ways by any change in these respects. Again, as to domestics. If we subdivide them into laundry women, cook and assistant, and eight or nine waitresses, housemaids, etc., and remember what all the washing, cooking, attendance on those who cannot wait on themselves or one another, and cleaning such an establishment entail, the wonder is, not at the number employed, but at the possibility of accomplishing it all with the present number with efficiency, regularity and punctuality. A matron charged with supervising the whole domestic economy, a boys' nurse with the oversight of seventy to eighty youths from six years of age upwards, in all that relates to their clothing, cleanliness and health, a girls' nurse with some sixty girls to watch over in the same respects, will hardly be deemed supernumeraries or sinecurists.

The Teaching Staff.

But is the staff of teachers and instructors larger than it ought to be? Let it be remembered that in every branch of instruction the teaching has to be individual in its character. If any one will take the trouble to try and teach one blind child anything and then ask himself how long it would take him to struggle with, say six, ten or twelve all wanting to learn the same thing at the same moment, he will see exactly where the difficulty lies. Taking first our girls' industrial work in which, with very rare exceptions all our female pupils take part; we have only one lady over the work room (sewing by machine and hand, fitting up work, etc.) and one over the knitting (machine and hand) and fancy work in all its branches. These two have an assistant between them, a former pupil who gives her help in either room as the pressure of work demands it. We have one instructor for the willow-work, and one who attends twice in the week for piano-tuning. The kindergarten class of course has its own trained directress. There remain the two principal departments of instruction, the literary classes and music. As already mentioned there are four teachers to each of these branches.

The Music Staff.

The senior music teacher has five pupils on the pipe organ, seven on the pianoforte, seven in a daily vocal class for advanced voices; a junior vocal class meeting once in the week from 3 to 4 p.m. and a senior vocal class twice a week at the same hour. This in addition to instruction in sacred vocal music to the pupils congregationally, as well as to his fair share of general oversight, of reading to the male pupils, and all the calls which form a necessary part of the life of an officer in an institution for the blind.

The senior lady music teacher has fifteen piano pupils, mostly the more advanced, and takes a class daily in counterpoint and harmony. The other resident lady teacher has 24 pupils on the piano or reed organ and also a daily class in harmony. Both ladies take their share in duties out of class hours. The fourth music teacher is non-resident and attends five mornings and two afternoons in the week. She has thirteen pupils, all boys.

All music taught it must be recollected has to be dictated. The process of instruction is slow, constant repetition is necessary. How can anyone say then, that in point of numbers, our music staff is excessive? And who would wish to limit its capabilities when it is borne in mind that music is joy to the life even if it is not, as in many cases it is, a means of permanent maintenance to the blind.

The Literary Staff.

I come last to the literary teachers. Their classes are usually attended by 80 to 90 pupils. No educator of the blind will admit that, under our system more than a dozen can be properly taught in one class. Such appliances as the pointer and the blackboard, by which pupils can be taught by the roomful in public schools at a time are not possible with us. Even if the class is addressed collectively the several pupils must have their memory tested and stimulated individually. The public school teacher's idea is the instruction of the mass; the teacher of the blind has to deal not with the mass but the unit. Now in any public school with 80 to 90 pupils from the highest to the lowest grade taught on the collective system would anyone say that less than two teachers would be required? Then if two be needed to teach the numbers mentioned of seeing children possessing all the educating power and resources of the eye, on the collective system, can four be too many to accomplish the work on the individual system with pupils in darkness? Must not every rational person agree with our experienced examiners when they express the opinion that the number of the literary staff could not "in any way be reduced without serious injury to the classes and the Institution."

Physical Culture.

Physical culture is an indispensable branch of the training of the blind. Their lack of natural robust recreation has to be supplied by the gymnasium scientifically conducted. We have an officer whose special duty it is to direct the pupils' gymnastic and calisthenic exercises. He also acts as supervisor of the male pupils out of class hours, and in other ways performs many useful duties.

A Comparison.

A comparison of our staff with that of other institutions for the blind will show that the figures on the whole are in our favor. So far as the reports of the leading institutions in the States assist me, I find that while we have a teaching staff, all told, of fifteen (15), the Perkins' Institute, Boston, with provision for about the same number of pupils, has thirty-three (33); Pennsylvania (about 180 pupils) twenty-seven (27); New York City (200 pupils) twenty-three (23); while New York State with about the same number of pupils has exactly the same number of teachers as ourselves. These are institutions with which the comparison may be made with most fairness. Of course a few pupils, more or less makes little or no difference. Our full number is 140 and we have usually approximated pretty nearly to that figure.*

Cost of Maintenance.

The cost of maintaining an institution for the blind is, for reasons already given and others always large in proportion to tangible results. If looked at from the mere economist's point of view it is a great outlay for small and often indefinite returns. But then, in the same sense, the expenditure on asylums, reformatories and other provisions for the less fortunate or helpless may be accounted wasteful. Nay, is not a good deal of money thrown away on the incapable or unworthy in the ordinary expenditure on our public schools for the sighted? The fact is, that the economical is only one side and the least important one to be looked at in this connection. Christianity, represented by wise and beneficent statesmanship, revolts from such mean conceptions of duty. It does not educate the blind only to provide future consumers of dutiable goods or contributors to municipal taxes. The legislature which lately to a man cheered and welcomed a humane measure to provide for the protection of homeless or neglected children, is not likely to ask whether it will pay to educate the blind. The sole question will, I believe, be what should its cost to give every blind child in this province such an education as will place him or her on the nearest equality with the seeing? The reasons why this is an expensive process, some of which have been already noticed and commented on may be summarized as follows:

(1) The inability of the blind to contribute to their own maintenance while under instruction.

(2) The large amount of domestic and other help consequently required.

(3) The demand of necessity for individual as contrasted with collective teaching.

(4) The number of branches of instruction covering both ordinary education and industrial training.

* I read in a recent publication: "The Pennsylvania Institution for the Blind began its sixty-third year with one hundred and sixty-seven pupils and *thirty teachers!!*"

The causes of a large expenditure under the first, second and third heads have been already discussed. As respects instruction in its several lines I find that by a comparison with such leading institutions in the States as I have already referred to, the cost of instruction averages about ninety-eight dollars ($98) per head while ours is from $55 to $60 per head. In attempting a comparison with American institutions of the total cost of maintenance exact figures are hardly obtainable as the charges vary in character and the distinction between payments on revenue, and those on capital account are not always on all fours with ours. But, by my best efforts, I am able to say that, in this respect the comparison is most favorable to Ontario. We have, it must be remembered, a larger sum to pay for fuel than most of the institutions in the States; we provide clothing for several indigent pupils, always chargeable there to the municipalities, and our arrangements for guides to travelling pupils are unknown on the other side. Yet I find that while in 1893 and 1894 the average cost per pupil in Ontario was respectively $260.85 and $267.66 in Boston by the last report before me it was, on the same basis, $316; New York City, $315; New York State, $294; Pennsylvania, $270; Michigan, $284; Texas, $287 and Maryland, $280; Illinois gives the low average of $232, but I am inclined to believe that the school population there includes a class of over-age persons by which the average attendance is largely increased, and the average cost proportionately lessened. Wisconsin averages $240. Taking the whole of the institutions named the average cost per pupil is $278. In our own case our fixed expenditure is quite equal to a pupil population of 150 to 160 With that number the average would be reduced as low as any in the above list. I have now, I think, answered all the objections with which I proposed at the outset to deal. I trust I have made it clear that our educational standard is sufficiently high; that the industries taught are the best that, in view of all the circumstances have yet presented themselves; that our staff is not larger than efficiency requires: and that the expenses are not greater than those ordinarily needed to maintain such an institution.

Pupil Population.

The enrolment of pupils in the year ending September 30th, 1894, numbered 150, of these 85 were males and 65 females, as against 90 males and 64 females, a total of 154 entered in the previous year.

The pupils in attendance at the close of the session in June last numbered 133, of whom 74 were males and 59 females. Of these, 59 males and 51 females, a total of 110, had returned on the 30th September, 1894. This leaves twenty-three to be accounted for as follows:

Graduates and retired pupils:

	M.	F.	Total.
Willow shop (with outfits)	3	0	3
Piano-tuning, with pipe organ and pianoforte, and literary classes	1	0	1
Piano-tuning and literary classes	1	0	1
Literary classes and industrial work	0	1	1
Work room and knitting	0	1	1
Music classes (advanced pupils, not full graduates)	1	1	2
Piano-tuning (to enter factory before graduating)	1	0	1
Willow shop pupils (over age) with partial outfits	2	0	2
Excluded on account of physical or mental incapacity	1	2	3
Excluded on account of improved vision	0	1	1
Left to follow callings	2	0	2
Detained by ill health	1	1	2
do for surgical treatment	1	0	1
do temporarily for domestic reasons	0	1	1
Retired, cause not assigned	1	0	1
	15	8	23

Our returns to 30th September, 1894, show 126 pupils on the register (68 males and 58 females), four less than at the same date last year. Sixteen, not on last year's register, have been admitted, thirteen for the first time and three who had been on the roll at some former period.

The new pupils' ages are as follows :

	M.	F.	Total.
Seven years	1	0	1
Nine "	3	1	4
Eleven "	0	1	1
Twelve "	1	1	2
Fourteen years	2	0	2
Twenty "	1	1	2
Thirty-eight "	0	1	1
	8	5	13
Three former pupils	1	2	3
Pupils of last session	59	51	110
	68	58	126

The arrival of one new pupil while this report has been in process of compilation, and advices as regards the absentees and others, indicate that the number with which the Institution closed in June will be shortly reached. While on this subject I may remark on the tendency rather to a limitation than increase in the number of those eligible for admission or retained when admitted. Four causes at least are evidently operating in this direction.

(1) The cessation to a large extent of promiscuous immigration.

(2) Improvements in ophthalmic surgery and antiseptic methods.

(3) Exclusion of those incapable of receiving appreciable practical benefit.

(4) More cautious treatment of undesirable applicants.

Not a few of our pupils in the past have been importations who. either from impaired vision, or a tendency to blindness, or from exposure under new conditions to unaccustomed avocations, have drifted into the Institution. This, however, is now apparently of infrequent occurrence. The great advance in ophthalmic surgery is having a wide influence, not perhaps so much in curing blindness as, by prompt and skilful treatment, preventing it from becoming permanent, or by giving to the eye sufficient vision to meet the demands of many of the avocations of life, so that recourse to our methods is unnecessary. Then again, in a preventive sense, antiseptic science is doing a great work. Legislation has, in some cases, come boldly to the aid of the profession in this regard. As president of the late Convention of American Educators of the Blind, I took the opportunity of referring to the questions of causation and prevention and may be permitted to insert the following extract from my opening remarks :

"In Great Britain an intelligent attention to the causes of blindness has already borne fruit. In a letter to the London *Times*, from the pen of Mr. Buckle, superintendent of the York School for the Blind, are some very valuable statistics bearing on this point In 1871, Mr. Buckle remarks, there was in England one blind person in every 1,051 ; in 1881, one in every 1,137 ; in 1891, one in every 1,235. If the ratio of 1871 had been maintained, the total blind in 1891 would have numbered 27,569, whereas the census returns showed only 23,467, or a reduction of 4,102 in 20 years. The fact that the decrease of blindness in children under five years of age has been 31 per cent. is not more gratifying than it is suggestive. The further statement, that in persons over 65 years of age the decrease is 27 per cent., bears proud testimony to the advance in the science of ophthalmic surgery. Considering the various forms of eye disease to be met with among the very mixed populations of our institutions, too much care cannot be taken to avoid the risks of contagion from *purulent conjunctivitis* and other like causes.

Neglect of due precautions cannot fail to lead to irreparable mischief. On the other hand, with the ever increasing experience and improved methods and appliances of the skilled oculist; with a more intelligent readiness to resort to his advice in place of that of the unskilled operator or the pretentious quack; with precautions against contagion in connection with the family or institution or school or any place of public resort; and with the more radically preventive measures previously hinted at systematically enforced, cases of actual blindness should become few indeed as compared with their present number."

The necessity for excluding those who, by reason of physical or mental infirmity, are ineligible, while questions of degree arise demanding careful and thoughtful treatment, is too obvious to need comment. Such cases are fit subjects for an asylum; they are out of place in a school. And I feel sure that a very cautious attitude towards all over-age applicants is the policy which will meet your approval. Our new pupils, with perhaps one exception, are rather above than below the average standard of intelligence.

Graduates.

Of the three young men who graduated from the willow shop, I have specific information that two are doing well. Of the success of the third, should his health not fail him, I have no doubt. I am not apprised up to date regarding the prospects of others.

The Staff.

One change in the staff has occurred owing to the retirement of Mr. George McIntosh, literary teacher, and the consequent appointment of Mr. T. Walter McLean to fill the vacancy. Of the latter gentleman's recommendations, and of the merits of the staff generally, I have said sufficient for the occasion elsewhere.

The Literary and Music Classes.

The reports of the respective examiners will fully describe the progress of these classes. I have already indicated some possible opportunities for slight improvements and these will be carried out whenever found to be desirable. It is very pleasant to know that in all such matters the end can be attained without friction, and that, on the contrary, all co-operate with me for a common end with harmony and cordiality.

The Piano-Tuning Class.

This class contains twenty pupils at the present time, of whom fourteen were under instruction last session, while six are new candidates. I have alluded to the necessity for putting this very important department on a more liberal footing, both as respects instruction and equipment.

The Willow Shop.

The many that have graduated during the past few sessions, or who have retired with partial outfits, but equal to their opportunities or abilities, and the causes affecting admissions to the Institution generally, have reduced the number of pupils in this branch of instruction at the present time to twenty. Candidates for transference from other classes, or new applicants, will probably increase the class to nearly its ordinary strength as the session advances. The instructor's report is as follows:

Mr. A. H. Dymond, Principal:

Sir,—I have the honor to submit my report upon the operations of the workshop during the year ending September 30th, 1894, and to refer to some of the details connected with the teaching of twenty-two blind youths the "fine art" of earning their own bread and butter. It would be wearisome work to explain the process by which a blind youth, who perhaps has never been allowed to handle a knife, whittle a stick, or do anything but talk and listen for the dinner bell, is sometimes converted into an industrious self-sustaining workman. It would be a grand thing if we could make skilled workmen of all such and find them positions, but we cannot do this.

The following statement of sales and work made and on hand will show to some extent the practical nature of the instruction given in the workship during the session. Let it be remembered that this work is made by blind apprentices, many of them only in the shop a few hours each day, and a few of them of the class described above, also that very much of the work made by these blind pupils during their first year's efforts has no commercial value and that their instruction means a great waste of materials, and then a fair estimate of the practical nature and value of the Institution may be made.

Sales made by trade instructor	$462 75
Stock on hand	75 00

A supply of willow and chair cane was given to nine pupils who had made considerable progress during the session sufficient to enable them to make a few articles of willow-ware without the aid of the instructor. The following statement will give further evidence of the practical nature of the instruction given to those pupils during the session :

J. S. earned	$14 00
J. B. "	40 00
J. T. "	15 00
W. M. "	12 00
H. G. "	20 00
J. B. "	22 00
A. L. "	5 00

Two others have not reported.

H. G. is a pupil who learned the mat-making in an English institution, came to this country and started mat-making, but found that mats, the product of prison labor, could be bought in this country at little more than it cost him for the raw materials. He is now learning willow-work, and from his first effort as shown above, feels satisfied that he will be able to follow this work after he leaves this Institution with profit.

The two last above-mentioned pupils have not returned to the Institution, but one of them was reported to have been working steadily at his trade during the vacation.

At the close of the session three of our pupils were found to be competent workmen, and, on your recommendation being approved, were supplied with outfits consisting of tools, models, willow, etc. Reports from these graduates show them to be working at willow-work and earning their own living.

A partial outfit was given to a fourth pupil whose health would not permit of a steady application to work, and who had received under this circumstance all the instruction he could benefit by. This pupil, when health permits, will be able to earn sufficient to pay the cost of food and clothing.

The exhibit made by the industrial departments of this Institution at the Toronto exhibition attracted much attention. Not a little surprise and a great deal of favorable comment were expressed by thousands of visitors at the great variety of useful articles our pupils are taught to make.

During the vacation I came in contact with a number of former pupils, suggestions were solicited from them, and the question was asked, "Can you suggest anything above what we are doing in the way of industrial instruction for the blind that would be of permanent value?" To this they all but invariably replied in the negative.

The present session has commenced with twenty pupils in the workshop, they all seem cheerful and teachable ; the old lessons will be enforced that work is ennobling and idleness demoralizing, that the earning of one's bread and butter is a "fine art," and the first occupation of man.

I have the honor to be, Sir,

Your obedient servant,

THOMAS TRUSS,

Trades Instructor.

BRANTFORD, October 1st., 1894.

The Work-room and Knitting and Fancy Work Classes.

These classes have well maintained their character for good and tasteful work during the past year. The respective classes are now fairly well proportioned and of manageable size. Care is also taken to secure for the pupils a due share of instruction in the first-named room, where the severely useful is perhaps a little less attractive than the very beautiful and ornamental products of knitting and fancy work.

The Kindergarten.

The literary examiners include the kindergarten in their reports. Its usefulness cannot be overestimated. The class this year numbers fourteen members.

The Library.

The following are the additions to the library since my last report was issued: Kingsley's "Water Babies;" Lubbock's "Beauties of Nature;" "Rasselas;" "Peasant and Prince;" Biographical Sketches; Abbot's "Julius Cæsar;" "Story of the Saracens," and stories of American Progress, all in line type. Stainer's Organ Method, Theory of Sound, and a large assortment of music in N. Y. Point.

Health—Discipline.

I am happy to state that during the last session we were free from epidemic disease altogether, except for a couple of cases of whooping cough. Other claims on our physician's skill occurred from time to time. To these Dr. Marquis will make sufficient allusion. An accident to the cook, an aged woman, from fracture of the hip joint, and the sudden death of a young domestic will also be referred to in the physician's report. One male and female pupil who were attacked respectively with dysentery and typhoid fever were placed in our excellent city hospital and made good recoveries. A second male pupil, an adult, in whom symptoms of pulmonary consumption had, previous to his return developed themselves, was also sent to the same Institution where he remains, awaiting, I fear, the not distant end. A few mild cases of chicken-pox have also appeared, and some children are still under care for that malady. The discipline of the Institution was well preserved during the past session. One youth, who persisted in breaking the rules by using tobacco, was sent home. He has been re-admitted after promise of amendment, on probation.

The Gymnasium.

Intimately connected with the health of the pupils are the gymnastic exercises, in which all in turn systematically take part. Our instructor in this department, Mr. Padden, has made the work the subject of special study and observation and the results are highly satisfactory.

Oculist's Examination.

The visit of Dr. Osborne, our examining oculist, took place in the spring of the year. One hundred and thirty pupils were examined. His report will no doubt be read with much interest.

World's Fair and Toronto Exhibition.

Those who had an opportunity of observing our exhibit at the World's Fair at Chicago were unanimous in their complimentary references to its excellence. I believe a "diploma" is forthcoming as a permanent record of the estimation in which our display was held. Many of the goods sent to Chicago being returned in good condition, I arranged, with your approval, to send them, with some others, to the Toronto exhibition for this year. The exhibit was in charge of Mr. Truss, our Trades Instructor, who refers in his report to the great interest it excited. He was assisted by one of our recent graduates, Samuel Prittie, who gave illustrations to the visitors of our methods of instruction This exhibit and the pretty wide circulation of an illustrated pamphlet, descriptive of the work of the Institution, have elicited many enquiries as to our conditions of admission, and I expect quite a number of applications will, in time, result.

The Grounds, Farm, etc

No considerable work has been attempted in connection with the grounds of the Institution this year, unless it be the planting of the locust hedge recommended in my last report, as a substitute for the old boundary fence. Nature is, with a little assistance and small outlay on our part doing much every year for the beautiful site and its surroundings. An almost uninterrupted drought of eight weeks' duration has blighted our hopes of a full crop of potatoes and field roots, but we still hope for quite a considerable yield. Our apple crop,—unfortunately mostly summer and early fall varieties,—has been unusually abundant. The absence of grasshoppers and also of destructive insects this year has been very marked, the more so after our last year's experience of these pests.

Improvements.

The erection of a barn with cow stable now nearly completed, will prove, I am sure, not only a great accommodation but an economical addition to our farm buildings.

The sewage system provided at a very considerably outlay some two years since, has fully justified our expectations. Nothing could be more perfect. The spring, from which we have always hitherto obtained a more than abundant supply of the purest water having of late shown signs of a falling off, connection (for use in case of need only) has been established between the city mains and our tanks so that we are ready for any emergency. The reflooring and furnishing with desks of the last of the class-rooms, and the substitution of a further number of the fine pupils' bedsteads made at the Central Prison for as many of the old ones may also be referred to.

An electric motor, to drive the bellows of the pipe organ, has been furnished by the Brantford Electric Street Car company, whose lines approach very closely to our buildings. The power is supplied from the company's wire. This is a great improvement on the old system of hand pumping. The pipe organ was also taken down during the vacation and thoroughly cleaned, a proceeding very necessary after thirteen years' use under somewhat unfavorable conditions.

I will not encumber this already lengthy report with any allusion to prospective needs or improvements, except to remark that the reasons for the oft-times suggested extension of the east wing are as cogent as ever.

Acknowledgments.

We have received as usual only kindness and proofs of good will from our many Brantford friends, always particularly remembering the clergy of the city in this connection. To all I desire once more to tender my hearty acknowledgments.

I have the honor to be, Sir,

Your obedient servant,

A. H. DYMOND,

Principal.

Brantford, October 1st., 1894.

LITERARY EXAMINERS' REPORT.

To Dr. Chamberlain,

Inspector of Charities for Ontario.

Sir,—The undersigned, at the instance of the Principal, instructed by yourself, commenced the examination of the literary classes in the Institution for the Instruction of the Blind, at Brantford, on the 30th of May ultimo, and continued it for three days. Although the examination was held about a week earlier than in the previous year the season was much more advanced—the foliage of the trees in the grounds and around the buildings was fully out and the flowering plants in full bloom. The Institution and its surroundings never looked better, and the same statement may be truthfully made of the interior. The class rooms and corridors were clean and in perfect order, and everything seemed to move along without apparent effort and without friction.

It has been our privilege and duty during the past thirteen years to examine the literary classes here and to note the general work and management of the Institution. It has often been a cause of surprise to us that children deprived of the most important of the senses could, in a brief interval of time, acquire knowledge so extensive, so varied and so accurate. Except in the single department of mathematics (for experimental science is out of the question here) the pupils of the higher classes are the peers of those in the higher forms of the public and the lower forms of the high schools. In subjects depending chiefly on the memory they are probably better. A few years ago one or two pupils took up Latin, French and German, and at least one matriculated with credit at Trinity University. But the experiment was not continued, possibly because it was out of the line of legitimate work and consumed time that might be otherwise more profitably employed. In our opinion the curriculum, as it now stands, is sufficiently extensive.

Of the efficiency of the teaching staff in the literary subjects little need be said—they are all experienced and thoroughly capable instructors, all holding provincial certificates, none lower than the second class grade, and all successful public or public and high school teachers. Of the thoroughness of their work the results of the examinations for years back afford the best evidence. Nor could their number, in our opinion, in any way be reduced without serious injury to the classes and the Institution, always provided the number of pupils is not reduced.

As the object of literary training in this Institution is, we presume, to furnish the pupils with a means of intellectual pleasure and to enable them hereafter to extend their reading rather than to fit them to earn a livelihood—in short to educate them—it follows that, as the end of the course draws near, they should devote themselves to music, to tuning, to basket-making and the various employments coming under the supervision of the efficient trade-instructor, and the young ladies in charge of the girl's industrial department. Thus they are enabled to make a start in life with a chance of ultimate success which otherwise they would never have had.

Hence the value of the Institution, hence the invaluable boon it confers upon a class of our people otherwise helpless, and hence, too, the strongest argument for its liberal support by the Province of Ontario. Only those who have seen the inmates at work and at play have observed their growing intelligence, and the tone of general kindliness that prevails, can duly appreciate the utility and the importance of such an establishment.

Of the character of the work done in the literary department the following synopsis of examination results may serve to show:

(1) Mr. Wickens' Classes.

(*a*) *Arithmetic.*—Class B; 21 members. Compound numbers, fractions, easy questions in percentage. Nearly all the class do "fair" work. About a quarter of them may be classed as "very good." The problems submitted were, as far as possible, of a practical character and were generally solved correctly and with facility.

(*b*) *Reading.*—Class A; 14 members. This class is in two sections. The first section reading Whittier's "Snow Bound," which they do with much taste, good expression and correct emphasis. The second section read Appleton's "Point Print" Reader and do so with facility. The marks obtained show the standing of the class in this subject.

(*c*) *Natural History and Physiology.*—Class A of ten. This is an intelligent class and possesses a very satisfactory knowledge of the subject, showing a fair acquaintance with the bones in the human frame, the muscles and their functions, the digestive and circulatory organs, the structure and functions, and of the mammalia, the classification and habits. The course of digestion and of the circulation was, in each case, correctly traced and the changes effected in the food and blood satisfactorily accounted for.

(*d*) *Writing.*—Class A; 14 members. The writing is marked six per cent. higher than that of last year. The examination consisted of a letter to the Queen congratulating her on attaining her seventy-fifth birthday, a receipted bill of goods and some general writing. The letters were easily read and were in very good form. The rest of the work was also well done—quite equal to the best of former years. The great object in writing, especially for the blind, is legibility, and in testing them this is kept principally in mind. For this class in addition to penmanship its application to the affairs of life is kept in view and hence considerable value is placed on neatness, arrangement and composition. We are pleased to find that constant attention is paid to these matters.

(*e*) *Geography.*—Class A; 15 pupils. Ten have been in this class only one session. The average age seems less than formerly. The examination was confined to the continent, dependencies and islands of Asia, and besides the ordinary map questions which covered the whole of the physical geography of the continent, a very thorough examination was given the class of the different races, their peculiarities, the countries inhabited by them, the different religions, their leading tenets and the countries where they flourish. The class was tested as to their knowledge of the products of Asia, so as to show principally the relation of Canada and Asia commercially. The answering was excellent. The individual examination of each pupil on seven different topics connected with the subject was certainly a severe test, but all did well. There is plenty of evidence of careful, intelligent work in this class. One instance may be mentioned. The pupils have acquired a most correct pronunciation of Asiatic names, a work of no small difficulty. The map in all its parts is perfectly familiar to them and their ability to locate places correctly and quickly, remarkable. The class did so well that the examiner complimented them at the close.

(*f*) *Grammar.*—Class B; 11 pupils. This class has made very fair improvement since last examination, as shown by a comparison of the marks. The examination was, probably, a little more difficult than usual, but the majority did very fair work. The parsing is fair, the correction of errors good, and their general knowledge of the inflections and the construction of sentences very good. They analyse ordinary sentences very well. The character of the teaching is always reflected by a class. This is especially the case in a class of blind pupils where the help from books and private study is exceedingly limited and where nearly all the knowledge acquired is imparted directly by the teacher. With one or two exceptions, dependent on mental peculiarities or defects, the class seems to have done a good year's work. The latest nomenclature is used, so it is seen the teacher keeps abreast of the times.

(2) *Miss Gillin's Classes.*

(*a*) *English Grammar.*—Class A; 10 pupils. This is an important and an intelligent class. The course is analysis of compound and complex sentences, parsing, first five chapters of Earle's Philology and Latin roots. They were thoroughly tested in analysis of extracts, both in prose and verse, and in parsing, and acquitted themselves well. They evinced a competent knowledge of the birth, growth and history of the English tongue and reflected credit on their faithful, painstaking and accomplished teacher.

(*b*) *Geography.*—Class B ; 18 pupils. This class was examined in the definitions, the sectional map of the United States in detail, also those of South America and the West Indies, and the productions, forms of government, etc., of those countries. The answering was, on the whole, very creditable ; most of them could readily find the various states of the Union, give their physical features, principal towns, rivers, mountains, productions, etc. The class had just three weak members, the rest were average or above.

(*c*) *Writing.*—Class D ; 20 pupils. This class, on the whole, writes very well. Some write only letters and short words which they form satisfactorily, others write simple sentences and still others write from dictation. If legibility be a test of excellence there are ten excellent writers in the class.

(*d*) *English History.*—25 in the class. Limit from Norman conquest to beginning of "Wars of the Roses." The examination was full and searching. No important event or constitutional change was omitted. The answering was generally accurate and prompt. Much interest was manifested by the class. One pupil obtained the maximum and seven came very near it

(*e*) *English Literature.*—21 in the class. This has always been an interesting class and an interesting subject admirably taught. The history was reviewed from the beginning as much in detail as time would permit, special attention being paid to the important epochs. Scott's narrative poems, as "The Lay of the Last Minstrel," "The Lady of the Lake" and "Marmion," were partially analysed, the principal scenes, events and characters described and the most striking passages quoted. The Shakespearian play for the year was "Hamlet." The plot of the drama was given, the most remarkable scenes illustrated by quotations and the principal characters described. The eagerness to answer of some, the fear of missing of others, the awakened interest of all, as if search lights were moving through the chambers of the mind, were novel and noteworthy. Four never missed a question in an examination lasting nearly half a day.

(*f*) *Canadian History.*—25 pupils in the class, containing every variety of talent. Eight pupils answered over 98 per cent. of the questions, nine others over 70 per cent. A few were quite low, a result to be expected in such a school. The great wonder is that, considering the very great difficulties that both teacher and pupil have to surmount, such general excellence is attained. The subject of examination was the history of Canada from 1759 to the present time. The questions were so framed that they covered the whole period, but gave particular prominence to the chief events. The pupils have a very good knowledge of the growth of the country, the changes in the form of the constitution, the causes that led to the great events and their results. They have also a fair knowledge of the chief men of Canadian history. The work has been gone over most carefully and with an evident desire to make the pupils have an intelligent idea of their country's history. It might be found advantageous to introduce a few more sketches of noted Canadians, especially those of more modern times.

(*g*) *Arithmetic.*—Class C. The teacher (Miss Gillin) manifests the same interest in the success of her pupils that has always characterized her teaching, whether as teacher of the highest female grade in the Central school of this city, or afterwards as instructor in a collegiate institute or ladies' college. Indeed, this class, as will be seen by comparing the accompanying list of marks with that of previous years, is decidedly better than the average class "C" in arithmetic. The class consists of twenty, nine boys and eleven girls. The grading is better than formerly and the pupils being more uniform in their attainments and ability have produced a better average result. The examination consisted of fifteen questions, from the application of the different tables of weights and measures, to the solution of practical problems, bills of account, and the application of the ordinary rules. The average of the class was 72 per cent , as high a percentage as any class of corresponding age would make in our public schools, with the difference in the part of the seeing pupils that they have the advantage of seeing the problem, and the further advantage that the work being before them, they can correct any errors they may have made. There has always been a desire to make these examinations elevate, if possible, the ideas of the pupils regarding their work, and no attempt to simplify matters that the students might look upon the examination as a mere matter of routine.

(3) Miss Walsh's Classes.

(*a*) *Physiology.*—Girls only. This class was examined upon the nervous system, digestion, circulation, respiration and the skin. The questions were based principally upon the public school physiology. In connection with the nervous system the class was examined on the senses of touch, taste, hearing, etc., and in connection with digestion and circulation upon the effects of alcohol. The examination was, as can be seen, a rather extensive one, but the pupils were quite equal to it, and although some of them had only spent a short time each week in the subject, all did remarkably well. There is a remarkable uniformity in this class, not exactly in attainments but in working power. The subject is evidently one in which they take much delight. The use of objects and models has very much increased the interest in the subject, and has made it much more intelligent to them. They were found to have very correct views of the laws of health and the means which should be taken to preserve it.

(*b*) *Reading.*—Class B. There are four subdivisions in this class, each using a different reader. There are five pupils in the "Star" reader, seven in the Fifth reader, three in the Third, and one in the First reader. The class was examined individually, each reading a different section, selected at the moment by the examiner. They were then examined individually; also in spelling, and finally in the meanings of single words and phrases. The reading is excellent. They have been taught to enter fully into the spirit of the selections and then to express it with elegance and force. Great care is taken to secure purity of tone and correctness of pronunciation. There is no rote work. This was proved by putting the finger of the pupil on isolated words. In every case the word was distinguished promptly and accurately. The spelling is very good, and their knowledge of the meaning of words very correct.

(*c*) *Arithmetic.*—Class A. The highest class in this subject is taught by Miss Walsh, who, in addition to a very high professional standing, holds a first-class Normal certificate, is full of the true teacher's spirit, and evidently spares no pains to produce the best results in her pupils. There is evidently no resting on past achievements, for the class, when age and time spent at the subject is considered, is quite up to the excellent standard of former years. Arithmetic is a subject that some persons, who are proficient in other subjects, do poorly in—yet the average of a class of thirteen was 78 per cent. in a set of fourteen questions, comprising examples in analysis, percentage, commission, taxation, interest, mensuration, partnership, and the application of proportion and some other rules. The problems were solved quickly and in a concise manner, showing a thorough understanding of the matter. That there has been no rote teaching was abundantly evident from the work done and the way in which they did it. The desire of the class to excel was very manifest, and the interest in the examination most intense to the very close.

(*d*) *Grammar.*—Class C; 13 pupils. Limits, parts of speech, inflections, indicative mood, tenses, analysing and parsing simple sentences. This class has generally correct notions touching this important branch of knowledge, was able to distinguish readily the parts of speech, knew the inflections well, was fairly well up in the verb as far as taught, could analyize simple sentences and parse correctly. One of them obtained 100 per cent. or full marks, three 90 per cent., and five over 70 per cent, making an average of 75 per cent.

(*e*) *Geography.*—Class D; 15 pupils. Limit, Ontario in detail. The examination was on a dissected map of the province. The pupils, mostly young, showed a pretty thorough acquaintance with the subject, were able to pick out the counties, point out the county towns, find the lakes and important rivers and islands, trace the railways and name the principal cities and towns through which they passed, as well as the counties they traversed. All this they do with much readiness and with a good deal of eagerness. One pupil obtained 98 per cent., eight 84 per cent, making an average altogether of 80 per cent., a pretty fair showing for a class of youngsters deprived of the blessings of sight.

(*f*) *Writing.*—Class C: 21 pupils. The work done here was exceedingly satisfactory.

(4) Mr. McIntosh's Classes.

(*a*) *Bible Geography*.—A class of twenty-three pupils of nearly all grades. Eight in class as matter of convenience, and not up to the rest. The following was the course pursued in the examination: Pupils were required to trace on the map the four journeys of Paul, describing as they came to them the principal cities, for what each was noted, and the incidents in Paul's life connected with them. The examination showed careful and thorough teaching. The pupils showed great pride in their work, and the class promises to be a most useful one. The instructor has managed to weave into this subject many facts of ancient history, which serve to excite the interest of the pupils.

(*b*) *Geography*.—Class C; 18 pupils. Their session's work had been the Dominion of Canada in detail. Two answered all the questions, six answered over 75 per cent, and the rest did fairly well. The examination covered the Dominion and the several provinces, the location of the cities, towns, rivers, railways, canals, etc. Then followed a description of the products, exports, imports, manufactures, etc. The result was very satisfactory.

(*c*) *Grammar*.—Class D; 14 pupils. The class was pretty thoroughly examined—was able to define accurately the terms used, to analyze simple sentences and parse easy words. Those who were in the class last year did well.

(*d*) *Arithmetic*.—Class D; 16 seniors and 11 juniors. The work is mostly elementary and the answering was generally satisfactory. The teaching appears to have been well done.

(*e*) *Reading*.—Class C; 18 pupils. A good class doing good work. Different books used. Pupils as a whole read fluently, with correct pausing, and emphasis, and good expression.

(*f*) *Writing*.—Class B; 16 pupils. Write quotations. Write with despatch and good form. The average was 85 per cent.

(*g*) *Object Class*.—17 pupils. Different kinds of grain, coal, salt, glass were submitted to the class. The identification was followed by a full description, involving production and uses. They had been fairly well taught.

(5) Kindergarten—Mrs. Murray, Director.

There are 12 children in the Kindergarten proper. By the help of the director they were examined in the fifth gift and made several inventions from it. They were also examined in weaving, modelling in clay, sewing and perforating, all of which they do remarkably well. Two motion songs were sung, the motions being natural and well executed, showing careful training. The children also chanted the Lord's prayer, and recited the 23rd Psalm in unison. The examiners were shown the work that had been sent to the Columbian Exposition at Chicago, and was so much admired there. Mrs. Murray is doing excellent work, and is ably sustainining the reputation of the Kindergarten. The pupils here were also examined in easy numbers, in easy questions in mental arithmetic, in counting and in miscellaneous knowledge, and did very well. Also in reading, in which they did very fairly.

(6) Gymnastics and Calisthenics—Mr. Padden, the Instructor.

We first witnessed the exercises of twenty girls, arranged according to height in three divisions, who gave an exhibition of marching, bar-bell exercises, and exercises with long poles. The marching was particularly good, and has done very much to improve the manner of walking. The other exercises were also well done and were entered into with great spirit. The second exercise was by sixteen small pupils, chiefly from the Kindergarten. These used wooden dumb-bells and gave about six different exercises, all well done. The third set was composed of ten young men and boys, who gave a good exhibition of parallel bar exercises, vaulting, etc. Mr. Padden is a successful trainer in this line.

During the examination we made several excursions through the fine grounds, including the extensive park in the rear, and were much struck with the number and variety of the trees and their great improvement in recent years. With the expression of our obligations to the principal and his staff for acts of kindness and courtesy we bring our report for 1894 to a close.

Respectfully submitted,

M. J. KELLY,
WILLIAM WILKINSON.

BRANTFORD, 11th July, 1894.

KINDERGARTEN DEPARTMENT.

TORONTO, November 23rd, 1894.

To T. F. CHAMBERLAIN, Esq., M.D.

DEAR SIR,—I was very much pleased with Kindergarten department in the Brantford Blind Institute. The room is a good one, and, as far as I could see, fully equipped with the necessary material.

The Kindergartner is one of the best women who could possibly be selected for the purpose. I also found the work in excellent condition. The children worked intelligently and with wonderful accuracy.

I am glad to report the Kindergarten as doing thorough work.

Yours truly,

MARY E. MACINTYRE,
Inspector of Kindergartens.

MUSICAL DEPARTMENT.

HAMILTON, June 4th, 1894.

To T. F. CHAMBERLAIN, Esq., M.D.,
Inspector of Asylums, etc.,
Toronto.

SIR,—I have again the honor of reporting to you the results of an inspection of the music classes in the Ontario Institution for the Blind at Brantford.

Since my last report several of the most advanced pupils have left the Institution to seek their fortune in the world, and as all are finding it more or less successfully through the musical education received in these classes, it forms a practical comment on their value.

But while their loss cannot but be felt in the exhibition of results obtained, the vacant places are being well supplied by younger pupils, and in my experience there has, I think, been no session which has shown such a generally satisfactory advance as the one now closed.

The organ class, which consists of the most advanced students, numbers seven, of whom three are boys, and four girls, the latter holding their own well in the competition; and as this class appears to offer the most available means of ultimate support, it is satisfactory to be able to record its progress.

There is an inevitable difficulty in finding sufficient opportunity for practice on one instrument, but as the only available remedy at present would appear to be making the class smaller it would be worse than the disease.

This class is under the sole management of Mr. Jaques.

The piano classes comprise about fifty pupils in all stages of advancement. Some of these promise in the near future to take a high position as executants, and as I have already remarked, the general progress has been more satisfactory than within my knowledge ever before.

The singing classes consist of the Kindergarten, with junior and senior general classes. The first named is not large, but appears to be filling its place as a preparatory school, and both its ensemble and solo singing were very pleasant and creditable.

The junior and senior classes sang several part songs and choruses. to which the same commendation may be given. The attack was sharp and clear, the tune steady, and the tone well sustained in pitch and quality.

In connection with these classes some solos were also very well sung by both male and female voices.

The chapel music still retains its old pre-eminence as a model of congregational singing. It is principally in unison, and both musical and thoroughly hearty and enjoyable.

The harmony papers submitted were generally correct and creditable, two being perfect and receiving the highest rating.

The violin class does not appear to make much headway, all the pupils being at present elementary. The most advanced pupil of last year was among those who have left the Institution.

I have again to express my sense of the courtesy and consideration of the principal, and my appreciation of the readiness and fairness with which every suggestion made by me was accepted by all concerned.

All of which is respectfully submitted.

Your obedient servant,

R. S. AMBROSE.

REPORT OF PHYSICIAN.

T. F. Chamberlain, Esq., M.D.,

Inspector of Public Institutions.

In forwarding to you my annual report of the Institution for the Education of the Blind, Brantford, for the year ending September 30th, 1894, I am pleased to say that the health of the inmates during the past year has, on the whole, been good.

During the month of December a mild attack of influenza affected from thirty to forty of the pupils, but none were sufficiently ill to require much treatment.

On the third of last February a servant, the cook of the Institution, between sixty and seventy years of age, fell upon the hardwood floor and fractured the neck of her right femur. Not having facilities in the Institution for the proper management of such cases, she was sent to the John H. Stratford hospital, where the fracture was put up; union took place in the usual time and the result was most satisfactory.

On the tenth of February two of the older male pupils developed well-marked symptoms of whooping-cough within a few days of each other; they were isolated in the hospital ward and cared for by our own nurses for six weeks; both did well.

On the sixth of April one of the housemaids complained of severe, intermittent pain over the region of the heart; I ordered some local applications and rest, but a second attack came on next day which showed her trouble to be *angina pectoris*. Active measures were at once employed to prevent a recurrence of the paroxysms, but without avail, for at six o'clock next morning, while suffering intensely, she sprang from her bed and died in a few moments.

About the tenth of September, three cases of well-marked chicken-pox, occurred on the boys' side, and nine on the girls'; as the disease was mild, and the affected ones had mingled with the other pupils throughout the Institution, we did not deem it necessary to put them in the hospital ward, but kept them for a few days in a separate dormitory. However, the disease is spreading, and now there are eight male and nine female pupils suffering from the disease or who have passed through it; most of them scarcely knowing that there was anything wrong with them.

We have now in the wards of the John H. Stratford hospital two pupils from the Institution; one female, sixteen years of age, convalescing from typhoid fever, which developed soon after her return here from holidays. The disease evidently was contracted at her own home, around which typhoid fever was then prevalent.

The other is a more unfortunate case. A male pupil, twenty-seven years of age, from the city of Toronto, left the Institution in June for his home in splendid health. He contracted a cold after accidentally falling into the Don river, sometime in the early part of July, and has since been gradually failing in health; he is now in the last stage of acute tuberculosis of the right lung and bowels, and has, to all appearance, but a short time to live.

In closing this report I cannot refrain from mentioning the uniform kindness and attention received by patients sent from this Institution to the John H. Stratford hospital. No hospital that I have visited excels in the attention given to patients in its general wards.

I have the honor to be,

Your obedient servant,

D. MARQUIS.

SPECIAL REPORT OF OCULIST UPON THE CONDITION OF THE EYES OF PUPILS.

T. F. Chamberlain, Esq., M.D.,

Inspector of Public Charities.

Sir,—I have the honor to report that on March 12th and 13th I examined the eyes of the pupils in the Institution for the Blind, 130 in number, two pupils being absent. In all cases requiring ophthalmoscopic examination, atropine was used to facilitate matters.

The following is the classification:

	Males.	Females.
Cataract—congenital and lamellar	11	13
Ophthalmia neonatorum	13	10
Atrophy of optic nerve	10	4
Pigmentary retinitis	6	5
Sympathetic ophthalmia	6	4
Granular ophthalmia	6	3
Injury	5	1
Attributed to scarlet fever	2	3
Corneal opacity	1	3
Myopia with choroiditis	3	1
Microphthalmus	1	2
Detachment of retina	3	..
Irido-choroiditis	1	1
Intra uterine keratitis	..	2
Astigmatism with amblyopia	..	2
Syphilis (hereditary)	.	1
Attributed to measles	..	1
" " diphtheria	1	..
Xerosis	1	..
Undetermined	3	1
	73	57

Cataract caused 24 cases—11 males and 13 females. Twenty two of these eyes have been operated upon; 16 by needling, 4 by extraction and two which were lost after an unsuccessful operation. Two cases were advised to get glasses, and 9 urged to have an operation. In all suitable cases the pupils suffering from cataract should be strongly advised to undergo an operation as early as possible. Owing to the short time at my disposal I was unable to adjust glasses to those requiring them. There is no characteristic marking of the incisor teeth in any of these cases.

Ophthalmia neonatorum claims 23 victims—13 males and 10 females. Of these 46 eyes, 21 are shrunken; in 19 there is opacity of the cornea with anterior synechia or staphyloma, showing that there has been perforation of the cornea; opacity of cornea in 2, opacity of cornea and lens and flaccid ball 2, opacity of cornea (central) with anterior polar cataract 1, removed 1. I would draw special attention to the prevalence of this form of blindness, inasmuch as most countries have introduced legislation for its prevention.

Atrophy of the optic nerve is the cause of 14 cases—10 males and 4 females. Of these, 6 are reported as born blind, two of whom are brothers; 6 others became blind under ten years of age. The parents are reported as "cousins" in two cases. The term "cousin" is elastic and it is difficult to ascertain whether first cousins are meant or a more distant relationship.

Of the 11 cases of pigmentary retinitis, four belong to one family and two to another, so the 11 cases represent 7 families. In four of these families the parents were "cousins."

Sympathetic ophthalmia caused 10 cases—6 males and 4 females. In 8 of these there is a history of perforating wound. One is reported as having received a blow and one was burned. The period which elapsed between the time of the injury and the commencement of sympathetic trouble varied from one week up; in one case the sound eye has gradually failed for 10 years.

The present condition of the 20 eyes is:

Injured eyes—	Removed	5
	Opacity of cornea and staphyloma	3
	Shrunken	2
Sympathizing eyes—	Adhesions between iris and lens, flaccid ball	6
	Removed	2
	Shrunken	1
	Myopic astigmatism	1

The eye with myopic astigmatism belongs to the case in which the left eye was burned and subsequently removed; it is not properly classed as sympathetic. The 9 cases of granular ophthalmia are reported as showing the disease at the following ages: two within the first year, one at 5 years, one at 6, one each at 8, 10, 12, 13 and 16 years. Of these 18 eyes the cornea is more or less opaque in 14, in addition to which entropion occurs eight times, while 3 show distinct pannus; 3 eyes are shrunken and 1 removed.

I must again thank Principal Dymond and Dr. Marquis for their kind assistance.

I have the honor to be,

Your obedient servant,

A. B. OSBORNE, M.D.

ONTARIO INSTITUTION FOR THE BLIND.

STATISTICS FOR YEAR ENDING 30TH SEPTEMBER, 1894.

I.—Attendance.

	Male.	Female.	Total.
Attendance for portion of year ending September 30, 1872	20	14	34
" for year ending 30th September, 1873	44	24	68
" " " 1874	66	46	112
" " " 1875	89	50	139
" " " 1876	84	64	148
" " " 1877	76	72	148
" " " 1878	91	84	175
" " " 1879	100	100	200
" " " 1880	105	93	198
" " " 1881	103	98	201
" " " 1882	94	73	167
" " " 1883	88	72	160
" " " 1884	71	69	140
" " " 1885	86	74	160
" " " 1886	93	71	164
" " " 1887	93	62	155
" " " 1888	94	62	156
" " " 1889	99	68	167
" " " 1890	95	69	164
" " " 1891	91	67	158
" " " 1892	85	70	155
" " " 1893	90	64	154
" " " 1894	84	66	150

II.—Age of pupils.

——	No.	——	No.
Seven years	2	Eighteen years	13
Eight "	2	Nineteen "	5
Nine "	9	Twenty "	6
Ten "	6	Twenty-one "	9
Eleven "	7	Twenty-two "	3
Twelve "	10	Twenty-three years	6
Thirteen "	10	Twenty-four "	2
Fourteen "	7	Twenty-five "	1
Fifteen "	11	Over twenty-five years	20
Sixteen "	7		
Seventeen years	11	Total	150

III.—Nationality of parents.

——	No.	——	No.
American	6	German	2
Canadian	58	Norwegian	1
Danish	1	Scotch	25
English	32	Wendish	1
Irish	15		
French	9	Total	150

IV.—Denomination of parents.

—	No.	—	No.
Baptist	10	Lutheran	1
Congregational	1	Methodist	45
Children of Peace	1	Presbyterian	30
Disciples	1	Roman Catholic	18
Episcopalian	40	Salvationist	2
Friends	1	Total	150

V.—Occupation of parents.

—	No.	—	No.
Agents	4	Marble-worker	1
Banker	1	Merchants	10
Blacksmiths	5	Physician	1
Bricklayer	1	Painters	4
Butcher	1	Printers	1
Carpenters	3	Stonemasons	2
Carriage-builder	1	Shoemakers	2
Clerks	1	Tailors	3
Cabinetmakers	3	Tanner	1
Locomotive fireman	1	Teamster	1
Farmers	50	Tinsmith	1
Gardeners	4	Tradesman	1
Hotel-keepers	1	Unknown	8
Inland Revenue officers	2		
Laborers	32	Total	150
Mechanic	1		

VI.—Cities and counties from which pupils were received during the official year ending 30th September, 1894.

County or city.	Male.	Female.	Total.	County or city.	Male.	Female.	Total.
District of Algoma	1	....	1	County of Middlesex	1	3	4
City of Belleville	.....	1	1	District of Muskoka	.....	.....	.....
County of Brant	2	2	4	" Nipissing	.....	1	1
City of Brantford	3	.....	3	County of Norfolk	1	1	2
County of Bruce	2	3	5	" Northumberland	.....	1	1
" Carleton	.....	.....	...	" Ontario	.....	3	3
" Dufferin	1	.....	1	City of Ottawa	6	.....	6
" Dundas	1	2	3	County of Oxford	1	.....	1
" Durham	1	.....	1	" Peel	.....	1	1
" Elgin	2	3	5	" Perth	.....	.....	.....
" Essex	3	6	9	" Peterborough	1	1	2
" Frontenac	.....	.....	.....	" Prince Edward	2	.....	2
" Glengarry	2	.....	2	" Prescott	....	....	.....
" Grenville	.....	1	1	" Renfrew	1	3	4
" Grey	2	2	4	" Russell	1	.....	1
City of Guelph	1	....	1	City of St. Catharines	...	.....	.....
County of Haldimand	1	2	3	" St. Thomas	1	2	3
" Haliburton	1	.....	1	" Stratford	.....	....	.....
" Halton	.....	.....	.....	County of Simcoe	3	3	6
City of Hamilton	2	4	6	" Stormont	.....	1	1
County of Hastings	.....	1	1	City of Toronto	19	7	26
" Huron	2	2	4	County of Victoria	1	1	2
City of Kingston	2	.....	2	" Waterloo	.....	.....	.....
County of Kent	1	.....	1	" Welland	1	1	2
" Lambton	6	2	8	" Wellington	1	1	2
" Leeds	3	.....	3	" Wentworth	1	1	2
" Lanark	2	.....	2	" York	2	4	6
" Lennox	.....	.....	.....	Northwest Territory	....	....	....
" Lincoln	.....	.....	.....				
City of London	.....	.....	.....	Total	84	66	150

VII.—Cities and counties from which pupils were received from the opening of the Institute till 30th September, 1894.

County or city.	Male.	Female.	Total.	County or city.	Male.	Female.	Total.
District of Algoma	1	1	2	District of Muskoka	3	.....	3
City of Belleville	3	1	4	County of Norfolk	7	7	14
County of Brant	7	5	12	" Northumberland	2	8	10
City of Brantford	12	7	19	" Ontario	6	7	13
County of Bruce	6	11	17	City of Ottawa	13	1	14
" Carleton	2	1	3	County of Oxford	4	3	7
" Dufferin	1	1	2	" Peel	1	1	2
" Dundas	3	3	6	" Perth	2	8	10
" Durham	2	3	5	" Peterborough	10	3	13
" Elgin	4	4	8	" Prince Edward	5	2	7
" Essex	7	16	23	" Prescott	1	.....	1
" Frontenac	5	2	7	" Renfrew	7	5	12
" Glengarry	7	...	7	" Russell	2	1	3
" Grenville	2	2	4	City of St. Catharines	2	.....	2
" Grey	7	10	17	" St. Thomas	3	2	5
City of Guelph	2	2	4	" Stratford	2	.....	2
County of Haldimand	4	5	9	County of Simcoe	7	10	17
" Halton	6	1	7	" Stormont	1	.....	1
City of Hamilton	10	11	21	City of Toronto	39	21	60
County of Hastings	5	4	9	County of Victoria	6	2	8
" Huron	8	9	17	" Waterloo	5	3	8
City of Kingston	5	4	9	" Welland	5	3	8
County of Kent	7	4	11	" Wellington	10	7	17
" Lambton	12	3	15	" Wentworth	7	8	15
" Leeds	11	1	12	" York	16	13	29
" Lanark	2	2	4	Province of Quebec	2	.....	2
" Lennox	3	1	4	Northwest Territory		1	1
" Lincoln	3	3	6	United States	1	.....	1*
City of London	8	8	16				
District of Nipissing	1	1	2	Total	336	251	587
County of Middlesex	8	9	17				

* On payment.

VIII.—Cities and counties from which pupils were received who were in residence on 30th September, 1894.

County or city.	Male.	Female.	Total.
District of Algoma	1	....	1
City of Belleville	1	1	2
County of Brant	2	2	4
City of Brantford	3	...	3
County of Bruce	......	3	3
" Carleton	.....	.....	.....
" Dufferin	1	.....	1
" Dundas	.....	2	2
" Durham	1	....	1
" Elgin	1	1	2
" Essex	2	7	9
" Frontenac	.....	.....	.....
" Glengarry	.....	...	....
" Grenville	.....	1	1
" Grey	2	2	4
City of Guelph	1	..	1
County of Haldimand	1	2	3
" Haliburton	1	. .	1
" Halton	.....	.....	.....
City of Hamilton	2	1	6
County of Hastings	.....	.....	.....
" Huron	1	.....	1
City of Kingston	2	.....	2
County of Kent	1	1	2
" Lambton	3	2	5
" Leeds	3	...	3
" Lanark	2	.....	2
" Lennox	...	....	.....
" Lincoln	.....	.....	.....
City of London	.....	.....	.....
County of Middlesex	1	2	3
District of Muskoka	.....	.....	.....
" Nipissing	.....	1	1
County of Norfolk	1	1	2
" Northumberland	......	1	1
" Ontario	.....	2	2
City of Ottawa	6	......	6
County of Oxford	1	....	1
" Peel	....	1	1
" Perth	.....	.....	.
" Peterborough	1	1	2
" Prince Edward	......	......	......
" Prescott	.....	.....	.....
" Renfrew	1	3	4
" Russell	1		1
City of St. Catharines	......		......
" St. Thomas	1	2	3
" Stratford	.....	......	......
County of Simcoe	3	1	4
" Stormont	....	1	1
City of Toronto	16	9	25
County of Victoria	1	1	2
" Waterloo	......	......	......
" Welland	1	1	2
" Wellington	......	1	1
" Wentworth	1	1	2
" York	2	2	4
Total	68	58	126

MAINTENANCE EXPENDITURE.

For the year ending 30th September, 1894, compared with preceding year.

Item.	Service.	Year ending 30th September, 1893.			Year ending 30th September, 1894.		
		Total expenditure, 1893.	Weekly cost per pupil.	Yearly cost per pupil.	Total expenditure, 1894.	Weekly cost per pupil.	Yearly cost per pupil.
		$ c.	$ c. m.	$ c.	$ c.	$ c. m.	$ c.
1	Medicines and medical comforts ..	236 21	3 4	1 76	197 48	2 8	1 49
2	Butchers' meat, fish and fowls	3,032 20	43 5	22 63	2,910 16	43 9	22 04
3	our, bread and biscuits.........	750 00	10 7	5 60	618 69	9	4 68
4	Butter and lard.........	1,147 27	16 4	8 54	1,313 39	19 1	9 95
5	Groceries	1,822 66	26 5	13 60	1,832 75	26 8	13 96
6	Fruit and vegetables	389 48	5 6	2 90	365 60	5 3	2 78
7	Bedding, clothing and shoes......	842 54	12	6 28	763 52	11 1	5 78
8	Fuel, coal and wood.	3,385 15	48 6	25 26	2,766 13	40 2	20 95
9	Light, gas and oil..........	844 61	12 1	6 30	742 73	10 8	5 62
10	Laundry soap and cleaning	279 85	4	2 08	325 00	4 7	2 46
11	Furniture and furnishings.... ...	327 44	4 6	2 34	426 72	6 2	3 23
12	Farm, garden feed and fodder	841 55	12 1	6 28	1,055 84	15 3	7 99
13	Repairs and alterations	401 26	5 7	2 99	750 99	10 9	5 68
14	Advertising, printing, stationery and postage.......	650 14	9 3	4 85	858 20	12 5	6 50
15	Books, apparatus and appliances..	578 83	8 2	4 26	1,000 57	14 5	7 58
16	Miscellaneous, unenumerated.....	1,625 64	29 3	15 27	1,364 07	19 4	10 30
17	Sittings at church and rent of water hydrants	420 00			420 00	6 1	3 18
18	Salaries and wages	17,390 72	2 49 4	129 70	17,532 84	2 55 4	132 82
	Totals	34,954 55	5 01 6	260 85	35,344 69	5 14 9	267 76

Average number of pupils in 1893, 134.
" " 1894, 132.

(4 Blind)

TWENTY-FOURTH ANNUAL REPORT

OF THE

INSPECTOR OF PRISONS AND PUBLIC CHARITIES

UPON THE

ONTARIO INSTITUTION

FOR THE

EDUCATION OF THE DEAF AND DUMB

BELLEVILLE

BEING FOR THE YEAR ENDING 30TH SEPTEMBER

1894.

PRINTED BY ORDER OF THE LEGISLATIVE ASSEMBLY

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1895.

OFFICE OF THE
INSPECTOR OF PRISONS AND PUBLIC CHARITIES, ONTARIO,
PARLIAMENT BUILDINGS, TORONTO, November, 1894.

SIR,—I beg to transmit herewith the Twenty-fourth Annual Report upon the Institution for the Education of the Deaf and Dumb, at Belleville, for the year ending 30th September, 1894.

I have the honor to be, Sir,
Your obedient servant,

T. F. CHAMBERLAIN,
Inspector.

THE HONORABLE J. M. GIBSON, M.P.P.,
Provincial Secretary.

PROVINCE OF ONTARIO INSTITUTION FOR THE EDUCATION OF THE DEAF AND DUMB, BELLEVILLE.

TWENTY-FOURTH ANNUAL REPORT

OF THE

INSPECTOR OF PRISONS AND PUBLIC CHARITIES

OF THE

PROVINCE OF ONTARIO.

PARLIAMENT BUILDINGS,
TORONTO, November, 1894.

To the Honorable GEORGE AIREY KIRKPATRICK, *Lieutenant-Governor of the Province of Ontario.*

MAY IT PLEASE YOUR HONOR :

I have the honor to submit herewith the twenty-fourth Annual Report upon the Institution for the Education of the Deaf and Dumb, at Belleville, for the year ending 30th September, 1894.

I have the honor to be,
Your Honor's most obedient servant,

T. F CHAMBERLAIN,
Inspector.

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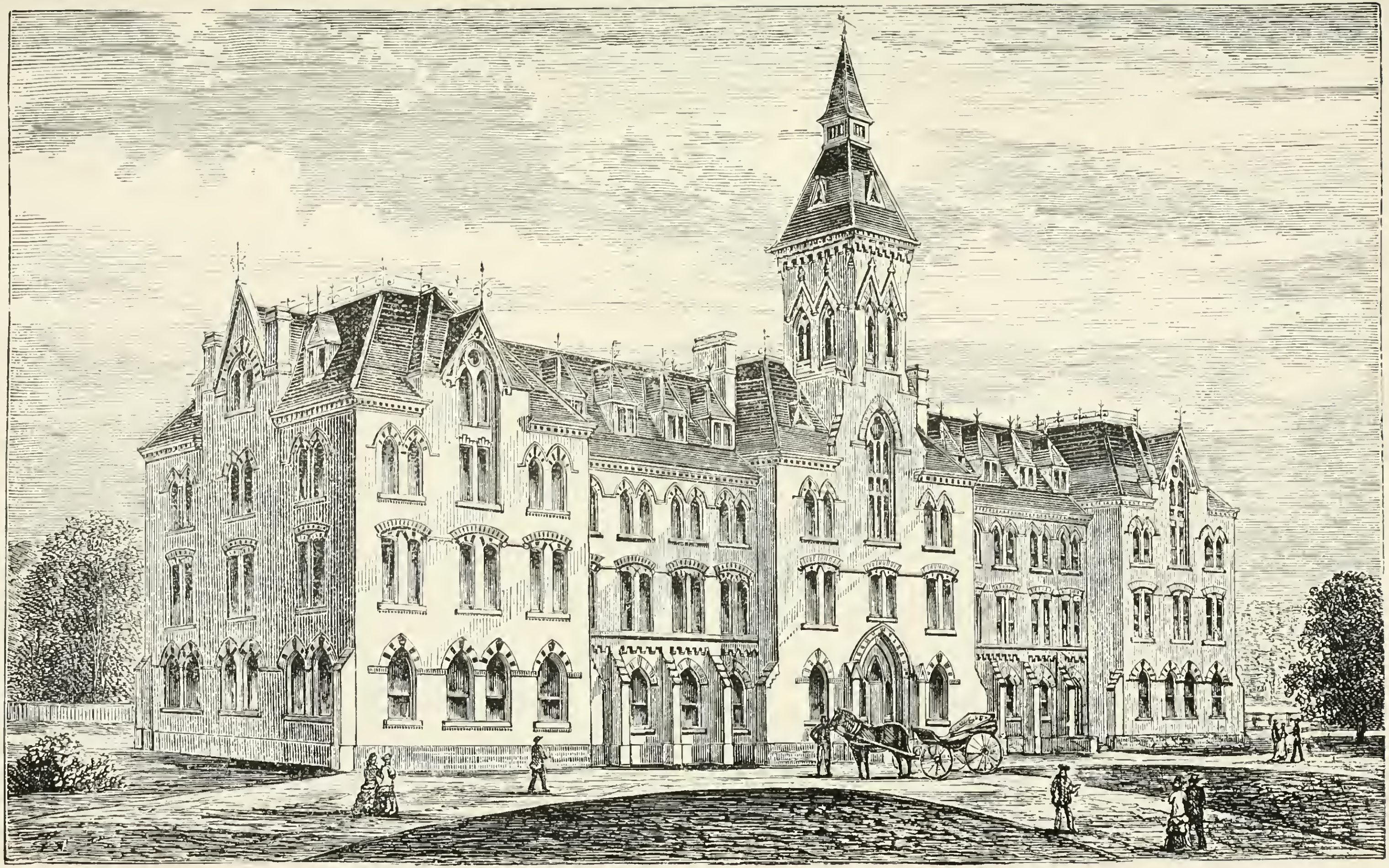


ONTARIO INSTITUTION FOR THE DEAF AND DUMB, BELLEVILLE.

THE INSTITUTION

FOR THE

EDUCATION OF THE DEAF AND DUMB

In submitting the twenty-fourth annual report of this institution I find greater advancement than in former years on account of the excellency of the staff of officers, and the utilization to better advantage of the knowledge obtained during the past years' experiences and the improved facilities in appliances and conveniences for caring for and instructing the pupils.

In an institution such as this where the pupils are mostly under twelve years of age, and are handicapped in the race for acquiring knowledge by their want of speech and hearing, one can easily understand that it is no ordinary task which the superintendent, officers and teachers undertake to perform in caring for the daily requirements of so many small children in moral training, physical culture, proper clothing, cleanliness, etc., as well as their treatment in time of sickness; finally fitting them for useful lives in such vocations as will afford them a comfortable livelihood, and make their pathway a happy one.

The results achieved during the past two decades is the best evidence of the wisdom of the government in establishing this institution for the education of deaf mutes. From 100 pupils in 1871 it has steadily increased until 295 were in training in 1893. This is the best index to its great prosperity, while the long list given in the accompanying report of the various trades and callings of pupils who have gone out from the institution shows that the knowledge imparted and training given has been eminently beneficial.

At the convention of graduates held at the institution in June last there was a general gathering from all parts of Canada and many places in the United States of those who in years past received their training and education in this institution. More than 170 men and women met together to relate their experiences since that time. All had kind words of praise for the benefits they had received and expressed gratitude to those who had been instrumental in enabling them to successfully make their way in the business life in which they were now engaged.

The records of those who have attended the full course of instruction, graduated, and gone out into the world useful and intelligent citizens, are full of interest and encouragement.

In my report of last year I gave an analysis of the causes of the loss of speech and hearing, as well as the population of deaf mutes in Ontario, Canada, and other countries, their ages, proportion of population, religious persuasion, educational status, employments at which they are engaged, etc.

During the past official year there were 295 pupils in attendance, 158 males and 137 females. The cost per pupil for maintenance for the same period was $176 29, as compared with $176.11 for the previous year.

The receipts from the farm exchange account for the year ending 30th September, amounted to $364.12, and the expenses on the same account were $209.75, leaving a balance on hand of $154.37.

From the information I have obtained from the officers and teachers of the Belleville institution as well as from others who have been long engaged in the education of the deaf and dumb in other institutions, I am of the opinion that the number of pupils assigned to each class at Belleville is too large to enable the teachers to do that justice to them that it is our duty to afford. There ought not to be over twelve pupils to a class, and I am pleased to note that the superintendent in his report has gone very exhaustively into the reasons why there should not be large classes. I am also of the opinion that the term of seven years for educating a deaf mute is too short and that it should be extended to ten years, in the discretion of the inspector and the recommendation of the superintendent.

The hospital erected on the grounds, convenient to the institution, and which was opened by His Excellency Lord Aberdeen, Governor-General of Canada, on the occasion of his visit to Belleville in May last, is proving a great convenience. Where there are congregated together so large a number of children there will necessarily be more or less sickness amongst them, and the hospital will afford the means of isolating the sick from the others and render their care and treatment much safer and easier. It will be seen by the report of the attending physician, Dr. Eakins, that there has been a good deal of sickness in the institution during the past year.

I am pleased to be able to state that only one death has occurred, the nature of the malady being of a complicated character.

During the year one of our old and faithful teachers has been called to his reward by the messenger of death, regretted by all who knew him.

There have been a few changes in connection with the teaching staff during the year, as will be seen by the superintendent's report.

I am pleased to state that on the whole there has been general advancement during the year by the pupils, as was exhibited by their annual examination.

We hope for a continuous improvement in years to come.

It is a pleasure to mention the uniform kindness and courtesy extended to me by the superintendent, Mr. Mathison, the officers, teachers and attendants, during my visits to the institution.

Full reports of my inspections, and the reports of the superintendent, officers and teachers are herewith submitted.

INSPECTIONS.

An official inspection of this institution was made by me on the 21st February, 1894, when there were in residence 257 pupils, 136 boys and 121 girls. There are fourteen schoolrooms, and for industrial work there is a shoe shop, carpenter shop, printing office, laundry and bakery.

The schoolrooms, chapel, dining room, dormitories, kitchen, servants' rooms, etc were all clean and in good order.

The new hospital has been completed, also the new stable and piggery. The conservatory lately constructed has been supplied with a stock of plants.

The farm stock comprises 5 horses, 7 cows, 20 pigs, fowls, etc.

The offices of the superintendent and bursar were found to be in good order.

The pupils are not only instructed during school hours, but also in other portions of their time in doing housework, sewing, etc.

The staff of teachers (15 in number) is efficient, and they take a great interest in their work.

I again made a visit to the Institution on the 4th October. On that day there were in residence 263 pupils, 114 girls and 139 boys; 33 of the pupils were admitted for the first time at the opening of the present session. They were all in good health, and the full staff of teachers was on duty.

During the summer vacation general repairs were made inside the building. New floors were laid where required and the class rooms freshened by paint. A new roof has been put n that part of the building used as a chapel, and a sky light gives the interior a more cheerful appearance.

The officers and teachers as a whole are zealous in their work and seem to be anxious for the success of the institution in every way. Good order prevailed in all the classes. Owing to the deaths and resignations there have been some changes in the staff during the year. A special class for drawing, under the supervision of a competent teacher has been established.

The several branches of industrial work—shoe shop, carpenter shop and printing office—were being carried on satisfactorily. The printing office is doing good work in instructing the boys in type-setting and general office work.

The new hospital, which has lately been completed, is proving a great convenience for the care and treatment of the children, who are from time to time afflicted with scarlet fever, measles, whooping cough, etc. There has been a good deal of sickness among the children during the past year.

The boiler-house, laundry, kitchen and other departments were all in good order.

REPORT OF THE SUPERINTENDENT OF THE ONTARIO INSTITUTION FOR THE DEAF AND DUMB, BELLEVILLE.

BELLEVILLE, September 30th, 1894.

Dr. T. F. CHAMBERLAIN,
Inspector of Prisons, etc.,
Toronto, Ont.

SIR,—I have the honor to submit the twenty-fourth annual report of this institution for the year ending September 30th, 1894.

Our work goes on as usual. We endeavor to make each year more successful than the one preceding. Experience suggests something more that can be accomplished for the advancement of deaf children placed with us, and we are anxious that our institution shall be second to none anywhere. That we have many things to learn in the conduct of an institution for the deaf we realize more and more as the years go by. The work is one of the most important that can engage the energies of the human mind, and to be even moderately successful those engaged in it must give freely the best service of which they are capable.

NUMBER OF PUPILS IN A CLASS.

I desire again and more particularly to call your attention to the recognized necessity of having a less number of pupils in the classes of this school than we are now able to arrange for. The nature of the work to be done by the teachers, and the great disability under which deaf children labor in the acquirement of an education, render it an absolute impossibility for teachers to successfully instruct a large number of pupils. This fact must be evident to those who know anything about the work, or have witnessed the process of class duties. Some persons are disposed to draw comparisons between classes for hearing children and those in schools for the deaf, and ignorant of the facts that must be considered in such comparisons, decide that teachers of the deaf have no reasons to complain. We have the testimony of those who have had experience with both classes, and they are unanimous in the declaration that twenty deaf pupils demand and receive more attention from a teacher than fifty hearing children in one room. The attention given the former is also much more exhaustive of the nerve forces, and hence more injurious to the physical system generally. It is this constant draft on the nerve powers that makes teaching the deaf a work of exceptional concern to those engaged in it. Each pupil must receive separate and special attention, collective or class instruction being quite impossible. The answers to questions given by the teacher are generally written on slates, and as errors are liable in language used, as well as in the statement of facts, each slate must be carefully examined, the errors marked, and perhaps additional information and explanations given. This process not only consumes time, but is exceedingly wearisome and exhausting to the nervous system. Teachers, as well as others, have learned from experience in the school-room that "idleness breeds mischief." If some of the pupils, being mentally brighter than others, finish an allotted task before the teacher is ready to read their slates, they must wait their turn, and unless other work is given this time of idleness is sure to bring annoyance to the teacher. And, if additional tasks are assigned to keep all employed, they, too, will soon be ready for inspection. It will thus be readily seen what a teacher of deaf children must contend with in correcting lessons, and explaining difficult words, questions, etc. But this is only part of the teacher's school-room work. New lessons must be prepared, as text-books are sparingly used or only to a limited extent in the senior classes. Difficult words, idiomatic phrases, and whatever is useless for the purpose of instruction must be eliminated, and such language as the deaf child can be taught to comprehend used in the presentation of facts. Geography, which is quite a mystery to the young deaf student, requires a good deal of laborious explanation by means of the manual alphabet, signs, etc. The teacher, after many hours and even days, have been devoted to such subjects, often finds that all the work must be gone over again. If, therefore, the class consists of eighteen or twenty pupils, whose work must be separately examined, and re-taught when not comprehended, the nervous strain soon has effect upon the teacher. This accounts for the comparatively large number of teachers of the deaf who are victims of nervous and physical weakness, if not entirely incapacitated. The state of New York deals generously with all classes of the afflicted population. Recently, the State Board of Charities selected a competent person as Commissioner, who was instructed to examine into and report upon the condition of all institutions subject to state control, with a view to bringing the work done by all to the highest state of efficiency. This commissioner, Mr. Wm. H. Stewart, has completed his investigations, and his report to the Board is suggestive of commendable progress in some respects. There are now six institutions or schools for the deaf, wholly or partially under state control, and Mr. Stewart has devoted a good deal of attention to their needs. Among other things he recommends an increase of the number of classes, not more than ten pupils to be in each class. This number, he says, must be made the maximum, if the best results are expected from the labors of the teacher. Such an arrangement would necessitate the appointment of more teachers in each school, and this would also increase the public expenses. He recommends the per capita paid by the state be not less than $300. I mention this merely to show the trend of public opinion in progressive communities as regards the education of the deaf. In many other states of the American Union the necessity for small classes has been generally recognized for some time. Ten to fourteen constitute a class in most of the schools, and this arrangement is found to result most satifactorily. We have seldom found it convenient to have less than twenty pupils in each class in this school, and frequently the average is above rather than below that number. It will be seen how great a disadvantage we labor under, and how much more trying to the physical strength of the teachers must be the work such a class entails. I would be very much pleased to be able to increase the number of classes, and reduce the number of pupils in each class.

The School Time Limit.

Another, and equally important matter I desire to call your attention to again, is the limit of time placed upon the attendance at school here. We also find that this regulation seriously handicaps us in the realization of satisfactory results of tuition. Especially is this the case in a comparative sense. Children possessed of all their faculties, attending the public schools, colleges, etc., of the country are generally allowed a longer time to complete even an ordinary rudimentary education than are the deaf pupils attending this school. It must be borne in mind, too, that the deaf enter school and pursue the whole course of study under disabilities that place them at a great disadvantage, even if they were given an equal time to do the work. Language is the chief object of their study. They begin their school experience almost, if not entirely, deficient of the common and familiar words that comprise the vocabulary of a hearing child not more than four years old. It requires years of patient, earnest and effective teaching to enable a deaf student to write an intelligent sentence with the simplest forms of our language. Under the most favorable circumstances, lack of ability and tuition, they cannot be brought to any degree of proficiency in the use of, or comprehension, of the common vernacular of the people. We all know, or should know, that the English language is the most difficult to master, as it is the most comprehensive and dominat in existence. It contains so many idiomatic phrases and words derived from other languages, that the most favored learner finds it an almost impossible task to master. I refer here to these who begin its study with no previous knowledge of the synoymous and idiomatic difficulties that hedge it about. A deaf child enters upon this important task under mental conditions almost similiar to a foreigner and is subsequently subject to much greater disadvantages. A foreign student of our language, with his hearing unimpaired, can gather much valuable information to aid him in mastering that language from the conversation he constantly hears about him. And, I may add, this source of information is more helpful to the learner than teachers or books, because it is the common vernacular of the people, and therefore, especially idiomatic. The deaf student must make the most of what he is taught under great disadvantages, as he hears no conversation, and gets all his information from his school lessons and the limited reading he is able to benefit by. With all these impediments in his way to success, he is limited to seven or eight years schooling, and is expected at the end of that brief training to take his place among more favored competitors in the struggle for existence. Hearing students, even if a higher or collegiate education is not attempted, usually get twelve or more years schooling. The time limit at this school also places us at a disadvantage in comparison to similar schools in the United States and elsewhere. With a few exceptions the limit is not less than ten years, and often it is twelve. Schools thus favored have an academic or high class students graduating from which are able to enter the collegiate department of the National College at Washington, and thus save considerable time and expense in passing through the course of study. I think we should have an extension of time for our pupils, and thus be placed in a position to show final results equal to the best schools elsewhere.

I give herewith the opinions of our teachers, most of whom have had long experience in instructing the deaf, as to what number ought to be in a class of deaf children and how many years tuition deaf boys and girls should be allowed.

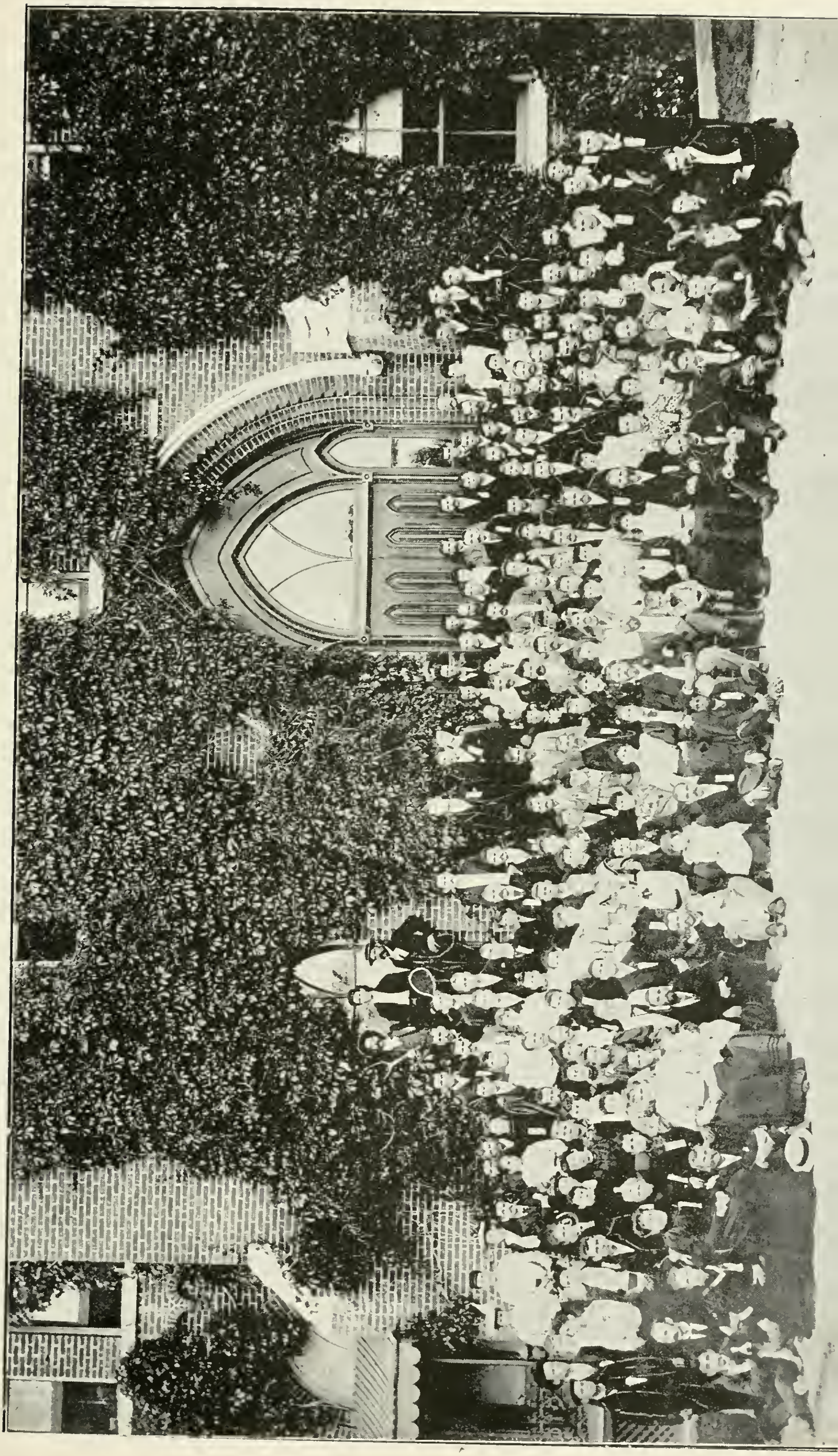
Mr. D. R. Coleman: From a long experience in teaching and being associated with deaf mutes, I am convinced that the number constituting a class should not exceed twelve or thirteen. I am willing, however, to qualify this opinion by granting that a class of eight or nine years standing, composed of pupils of equal mental ability, should be successfully taught if it numbered, say, sixteen as a maximum. My reasons are (1) That from the nature of the case class recitations are impossible, and the attention of the teacher to the pupils individually is imperative. (2) That the careful reading and correcting of slate exercises in a large class, necessary and important as it may be, consumes too much time and causes enforced idleness on the part of the pupils. (3) That better results would be accomplished in smaller classes, a more uniform standing be secured, and promotions facilitated. And, lastly, by a reduction of the number in the class, the depressing and despondent feeling that hangs over the minds of teachers of large, and, more or less, mixed classes, would be removed and one of hope and ccurage inspired. In regard to the second question, in my opinion, a ten-years' term of tuition should be the minimum. There are not now, and, except occasionally in a few accidental cases, never have been in this institution, young men or young women, who by virtue of age, superior education and force of character, could exert a wholesome influence over the other children in the school, or successfully perform special services requiring more than ordinary ability of children when called upon by the superintendent or others to do so. The average age of the graduating class this term is seventeen years, and they are now beginning to realize what an education for them means. It would be a subject of regret if they should be withdrawn or dismissed at a time when they are in the way of securing that which the institution was designed to afford.

Mr. P. Denys: These questions, implying as they do a desire to improve, if possible, the facilities now existing for the education of the deaf in this part, will, I am sure, be received with genuine delight by teachers, parents and all friends of progress. The very asking bears the impress of that broad philanthropy to which the banner Province has habituated us whenever it has been a question of bettering fellow-beings. As one who, for twenty years—the best of his life—has now labored in this field, I hail the movement with joy unfeigned and deep. Have we, who, although possessed of all our faculties, found the acquirement of knowledge so arduous a task, ever fully conceived what a stupendous undertaking it is for one deprived of hearing—that great channel of instruction—to even begin to master the English language? Here is a boy who at the age of ten is for the first time made to apprehend that which the normal child three years old already understands: familiar words and phrases—cow, dog, horse, whose names convey a meaning to the hearing little one, stand defiant enigmas as they are traced for the first time before the amazed vision of his less fortunate brother. Starting, therefore, as he does totally ignorant of the most rudimentary forms of our vernacular, having to acquire not only the elements of knowledge but the very instrument wherewith he must hew for himself a road into the realms of thought and of study, is it not our bounden duty to smooth as much as we can the path he is to tread and in all manner to facilitate his becoming one with us, a partaker of our rights, a sharer in the glorious privileges which, in education, are the just boast of this great province? Do you, then, your best for these poor, silent youths, for when this you have done, life shall yet have enough of care for them. In point of generous provision in this direction, Ontario has nothing to reproach herself. It is not much over two decades since she planted the acorn and to-day the tree is towering up among the proudest oaks, jealous of the protection its sturdy boughs afford our children. Yet, in the light of the first question, by reducing the number of children in each class, could not new hopes be cherished, new benefits conferred, new heights attained, new laurels won? To one who has toiled in this field for years, who has wrestled with slates and tasks innumerable, who knows that drawing your pencil across a word is not teaching, the question is easy of answer. Individual teaching which may be the exception elsewhere is here the peremptory rule. To educate is to draw out. Nothing is surer to remain with the pupil than that which has been evolved from him; hence the necessity of retaining as much of the individual effort as possible, and that this be done the necessity of time to the particular pupil imposes itself. Have twenty children; going over carefully one set of slates with them will take you the afternoon; have ten, in half the time you are ready for the next exercise, the difficulty so generally felt of keeping busy pupils who have passed, being likewise in a measure met. If the answers be given by the manual alphabet, instead of asking twenty children ten questions each I shall ask twenty questions of each of the ten children, greater interest and attention, as we know, always being brought by the party interrogated, with, it is fair to presume, corresponding results to that party. It is said that only so much can be assimilated every day by young intellects, which I suppose is quite true; yet as it is a question not of presenting new difficulties all the time but rather of reviewing quite often and re-writing what was once gone over, the task thus introduced, instead of being wearisome to the mind should, from its variety and judicious arrangement, bring it greater activity and strength. This will be all the more true if the lessons be made interesting and attractive to the class. I should add that it is easier to find ten or twelve pupils of even attainments than twenty, and we all know how much depends upon grouping together only children of about equal capacity. I am, therefore, heartily for a reduced number. When a train is too heavy you cut it in two and the engine which before groaned and puffed and labored, seems to fly with the lighter burden. Twelve to fourteen would be my idea. Such a number would be large enough to create emulation, yet not so large as to thwart the teacher's best efforts. Passing to the second question, if it be desirable to have the number in each class reduced that greater progress be made, an extension of time would seem but another way to secure that which we are aiming at and that is as complete and perfect an education for the deaf of Ontario as is given anywhere. True, in making the classes smaller, an appreciable advantage is already gained, yet as we have to dig the very foundation and the edifice we are asked to rear is, under the most favorable conditions, of difficult and protracted construction; as upon the intellectual, moral and physical training a deaf child receives at school largely depends his happiness here and hereafter; as to keep abreast of the educational movement of the times, new facilities should be afforded; as the hand must be furnished with a tool as well as the mind with light; as, in a word the best equipped man stands the best chance in this age of keen competition and hard struggle for bread, and Ontario shall not be content with second place in the race for excellence, we may be permitted to entertain the hope of seeing at no distant day such changes made as the ever advancing cause shall yet demand. A class of twelve bright youths under a live, capable teacher should in ten years leave our school prepared for the full duties of life, commanding by their intelligence the consideration of friends and fellow-men. I should take such a child at eight and dismiss him at eighteen praying that the winds of Heaven be fair to his young bark and that a happy and prosperous voyage here below end at the port of eternal safety.

The late Mr. J. B. Ashley: 1st. What I here state as my conviction is, as you are aware, founded upon an experience of nearly ten years as a teacher of deaf children. It is also justified by a longer experience as a public school teacher. In the latter capacity, I taught at a time and under a system of organization which made the work more laborious than at present. I can compare the effects upon me, physically and mentally, that came from a class of seventy-five and eighty hearing children, and also from a class of twenty deaf children. The latter require so much more unremitting attention to individual needs, and demand from a teacher such care in preparing or demonstrating lessons taught, that the strain upon the nervous system becomes a matter of serious consideration. This assertion will be more readily comprehended when it is known that every pupil in such a class constitutes a separate and distinct charge for literary instruction. There is comparatively little collective or class instruction. Instead of standing before a number of pupils with text-book in hand, and talking to the whole, or questioning promiscuously, a teacher of deaf children must make each pupil a class, and correct each slate or paper separately. Text-books, also, are sparingly used in schools for the deaf. The teacher must arrange lessons to suit the comprehension and experience of his pupils, and must present them in language free from the perplexing idioms and ambiguous phrases that are such stumbling blocks to deaf learners. This requires patience, care and close application to the monotonous routine of school duties. If pupils are idle they become more or less troublesome. If a teacher tries to keep them all employed he must prepare many lessons, read and correct many slates, and laboriously explain and illustrate the errors made by each pupil. With a class of sixteen or twenty deaf children the task is exceedingly trying, and especially affects the nervous system, thereby weakening the constitution generally. With this experience to guide me, I unhesitatingly state that classes in schools for the deaf should not consist of more than *twelve* or *fourteen* pupils.

2nd. A deaf child enters the work of procuring an education seriously handicapped. The disability under which it labors must be regarded as a very great disadvantage in this search for knowledge. It is deaf, and perhaps has been deaf from infancy, or since an early age. The ordinary words that constitute the language of even the uneducated class are unknown to it. The busy world about it is almost entirely a sealed book of mysteries. How different is the mental condition of the hearing child. From the time it begins to lisp a few monosyllables at its mother's knee until it reaches a recognized school age, it is constantly learning words and comprehending their meaning. When six or eight years old such a child has a command of an extensive vocabulary, and can use the language it has learned soon after entering school to express an idea or tell what has been taught. Years of patient work are required to teach a deaf child the language possessed by a hearing competitor at the beginning of its school life. Again, when a literary fact has been fixed upon the mind of a deaf child, the lapse of a few weeks it apt to erase it, or render its use more or less confused with other facts subsequently learned. This results from the state of comparative isolation in which the deaf child lives and studies. A hearing child after being taught anything, is aided in its memory by a daily and perhaps hourly repetition of the words or facts by schoolmates and associates. Hence, the necessity of moving forward slowly, and reviewing frequently, when deaf children are being instructed. But the time limit in most schools for the deaf places the pupils of such schools at a still greater disadvantage. They must complete their course of study, such as it is, in seven, or at most ten years. The hearing pupils usually have a longer time to procure even a rudimentary education. Therefore, considering the disabilities under which the deaf child labors, I am convinced that justice cannot be done it with a time limit of less than ten or twelve years' instruction.

Miss S. Templeton: The longer I am engaged in teaching the deaf, the impossibility of doing anything like ample justice to a class of twenty pupils is to me more forcibly and keenly apparent. It may be said that public schools often average sixty pupils to a



class. True—but class teaching and drill are and can be very largely used, while with deaf children individual teaching is almost exclusively required. The smaller the classes the more it can be indulged in; consequently the more marked will, or should, be the progress. How has Helen Keller, who is creating such a furore, been enabled to acquire such a proficiency of language and fund of information? How is her education being conducted? Does she only receive a twentieth part of a teacher's attention during four hours and a half out of the twenty-four for five days of the week throughout nine months of the year? No; the assiduous care of a devoted teacher is hers at all times. Could such individual and unremitting attention be given what a command of language might not be attained by a majority of deaf children? One of the greatest difficulties, if not the greatest, with so many pupils in a class, is how to keep those whose exercise is finished profitably employed while the work of the others is being corrected. If new work is constantly given the brightest ones will have it finished before the others have completed the first exercise assigned. Even should all be so nearly equal in attainments as to finish an allotted task in about the same length of time, from three to five minutes (and even longer according to the character of the work) will be occupied in the reading, correcting and criticizing of each slate. While, therefore, from one to two hours is taken up with one lesson, only from three to five minutes is given to each pupil (I refer to the work of the senior classes). How best to maintain the interest and enthusiasm of the bright pupils, work up the laggards, and, as far as possible, keep up the uniformity of the class is, and has always been, to me a source of perplexity. Taking all things into consideration, I would answer that a class of from twelve to fifteen pupils is enough to call forth all the tact, skill, ingenuity and patience of the most enthusiastic teacher, and, in my opinion, more cannot be handled in a satisfactory manner. As for the number of years' tuition to be allowed when one considers that every word, phrase and form of expression used in ordinary conversation and business has to be taught, seven years (the time now allotted) is very short indeed. Children possessed of all their faculties are not limited to such a short period, and surely those handicapped by deafness should have at least the same privileges. The hearing child is also at all times learning language unconsciously, while the majority of those deprived of this sense acquire very little outside of the class-room. Is not, therefore, ten years at least a short enough period to fit them for the after duties of life? Thus, a child entering school at from seven to ten years of age, with from ten to twelve years of tuition, would graduate at from seventeen to twenty-one—young enough to face the stern realities of existence. With, therefore, from twelve to fifteen pupils in a class, and from ten to twelve years' tuition, the teacher would, it seems to me, be enabled to do the pupils justice, and not pursue a hot-house system or one of cram, which, with the existing state of large classes and short period of school life, is, to a certain extent, unavoidable. Allow me also to state that the strain on the teacher who feels the responsibility of the work, under this high pressure system of large classes and short tuition period, is terrible, and the wonder is that more cases of severe illness and nervous prostration have not, as yet, been the result.

Miss M. M. Ostrom: Re "The number of pupils to each class." There are many points to be considered, but I shall content myself with saying that, from my experience in teaching deaf children, I have found a large proportion of them require individual instruction, and consequently think that twelve or fourteen children of average ability, properly graded, should be the maximum number of pupils for each teacher. *Re* "The number of years deaf children should be allowed tuition." I think from ten to fifteen years should not be thought too long a term. I have arrived at this conclusion in reasoning by analogy. When I consider the length of time necessary to educate children who possess all their faculties and have a fair command of language on entering school, many of whom learn the first words that are to form their vocabulary at the institution to which they are sent as pupils, should be allowed as long a term of tuition. In our public schools children remain under instruction from ten to fifteen years, and children who have the chief avenue of instruction closed should certainly be allowed the same length of time in which to complete their education. How many pupils in our public schools are prepared to enter the arena of life after having spent seven or eight years at school, as has been the case with children in some of our institutions? Certainly not many. Therefore

I maintain that our children should at least be accorded by our government the same opportunities of education that their more favored brothers and sisters enjoy. I shall hail with much pleasure any reform, and sincerely hope that some changes may be effected in the near future in order that the education of pupils may be more complete, and also that we may be able to compete more successfully in this great work with sister institutions. I cannot be satisfied to feel that the education of our pupils must occupy a second place in any particular.

Mrs. E. Terrill : Two of our teachers remarked yesterday : " We have corrected one hundred and thirty slates this afternoon." I looked into the faces of the two teachers who had performed this task and found the utter weariness depicted there, which I had expected. They certainly did no justice to themselves. How many years could such a strain be kept up without mental and physical prostration? As our years of experience grow do we not increase in usefulness? Then why not spare some strength for these later days? The new teacher starts in with an immense amount of vigor, has a desire to teach before school and after hours, can scarcely spare the few holidays interspersed throughout the session, and even expresses a desire to hold classes on Saturday. In some cases this lasts for several years, but at last the machinery of the system begins to weaken, and often there is a general break down of the nervous forces, and just when the teacher has become so valuable. Any means to evade this disaster should be seized upon. With a class of twenty or more pupils (as we have had ever since the day of opening) the energies of the teacher is taxed, as also the ingenuity, to keep this slow, monotonous work from flagging and losing spirit. It is most difficult to keep a class employed while the teacher is correcting the twenty or more slates, which are handed in every half hour or so, or as quickly as he can get the work on the board. Especially is it so if he gives the particular individual teaching which this class of pupils requires. With fifteen or less in a class the number of slates would be less and much more could be really accomplished, and at an easier pace, which would be a great relief to the teacher and very beneficial to the pupils. Too much drive and push is an injury to both. " Hasten slowly and without losing heart ; place your work twenty times upon the anvil " is indeed a very good class-room motto for us, and " with simple language and plenty of it," smaller classes and longer term of years, we shall hope for greater achievements in this great institution " second to none." How many years' tuition deaf boys and girls ought to be allowed considering their disabilities. Their disabilities, how great? Deaf children pass through a seven years' course, and have about then reached the point where their more favored sister or brother commences their education. They have not yet learned the art of reading books, the spirit of general conversation, or the use of idiomatic terms. When they leave school they generally lead a life of isolation. If they could read, so that it would be a pleasure to them, a new field of happiness, companionship and a means of self culture would be opened. One cannot but feel the greatest sympathy for the loneliness of the life that is before them, without the ability to lessen it by the delight of reading " the best of all books," and the pleasure of having the whole field of literature to wade in. People do not often trouble themselves to inform the deaf of passing events, but with a daily newspaper, the institution paper, and of course the sufficient education to understand what is read, and having acquired the art in an extended term of two, three or even four years, what a gain at so small an outlay as this would require. What a source of pleasure to the lonely one of the family circle. I wish I had a more powerful pen to portray this in a more eloquent and telling manner. A whole school can be benefited by drawing monitors from a high class ; just as the advanced pupils become useful in this way they leave us I have visited institutions where the term of years reached ten and over. I could not but notice the refinement and culture apparent in the older pupils and its marked effect upon the juniors of the school. I think the proper school age is from eight to eighteen, but I have known many cases where an admittance at the age of six has been a great benefit. As an instructor of pupils beyond school age I must put in a word or two for them : to the age of twenty I think they should be admitted. It is not their fault that this great boon of education has been denied them in their younger days ; there is scarcely a happier class in the institution.

Miss F. Maybee: In regard to the number of deaf pupils in a class, I think twelve is sufficient; that is to do justice to each one, for there are always a few backward ones who need individual instruction. Our programme of studies embraces so many different things that it is push and drive all the time, which naturally crams the children's heads. If less were in a class better work and more proficient pupils would be the result. I think there should be a junior and senior class in every grade, then the work could be more thorough and pupils would not be promoted till they were fit. The slow ones require so much more time spent on them that sometimes they are neglected while trying to keep the others employed.

Mr. W. J. Campbell: My experience in the education of the deaf is somewhat limited, yet it is backed by an experience of about fifteen years' teaching of hearing children, of studying child-nature, of watching the development of the young brain, and closely following the lines of thought in those connections, that all who would obtain success in the teaching profession should follow. I have striven to bring this experience to my aid when studying the principles that underlie the teaching of the deaf; and while fully convinced that the same general principles obtain in teaching the deaf that are our guides in teaching hearing children, I cannot, nor do I believe can any who are engaged in educating deaf children, fail to recognize that the one great gateway of knowledge,—the sense of sound, the hearing of the teacher's voice, which makes possible schoolroom education by classes—is closed forever to those with whose education I am now associated. This disability on the part of the pupils confines the education of the deaf to the method by individual instruction, or, in other words, to as many classes in the room as there are pupils. I should say then, that a room of twelve or at most of fifteen pupils, would tax to their utmost extent the energies of any teacher who is alive to his responsibilities of his position as such. Again, when we recognize that the disabilities of deaf children render their progress very slow indeed, we feel it to be important that their education should be as thorough as possible. When we consider that hearing children, with all the advantages attendant upon the possession of speech and hearing, obtain only a limited education during their public school course which extends from the age of about five years to thirteen years and upwards, and that the education of the deaf can never be so rapid as the education of hearing children, it would appear to me that, in order to do justice to the deaf of our province, their course should not extend over a shorter period than from ten years to twelve years, and indeed a course of greater length would do them no injustice.

Mr. J. C. Balis: 1st. The number of deaf children in a class should approach as near to ten as possible, especially when ages range from seven to eleven years. Where numbers hamper a proper individual treatment, the few very backward pupils must "go to the wall" in justice to those of greater ability and swifter grasp. It is far easier to ring the changes of action writing rapidly and repeatedly with ten than with fifteen or twenty individual actors. Variety is more extended and thoroughness more certain, with time and nerve force at minimum expense. 2nd. I think twelve years is not too extreme a limit to accord the deaf at school. But I would restrict the last two or three years to these only who exhibit a marked ability to profit by extension.

Mrs. Sylvia Balis: 1st. In a first year grade, such as I now teach, twelve is the limit as to numbers; if there is much difference displayed in the mental calibre of the children, I think ten is quite sufficient. 2nd. Under the system pursued in this school, the "combined" ten years should be allowed all children and two years additional to those showing ability to enter the highest classes and undertake studies such as are taught in the academical departments of other schools of this class.

Mr. T. S. McAloney: I would say through years of practical experience and observation in a number of institutions, that I consider twelve as a maximum number of pupils for a class of deaf children. A class of twelve is large enough to keep a teacher busy, very busy, but not large enough to overtax his strength and interfere materially with the progress of the pupils. It gives the teacher a chance to develop the minds of individual pupils and to show good results. There is such a diversity of mental action and intellectual capacity among the deaf that it is practically impossible to have a class well graded, and if a class is not well graded it requires a great deal of individual work. In large classes this is impossible. In large classes the correction of individual mistakes and the recitations, no matter by what method they are conducted, become disproportionately long and take up too much time allotted for school work. They also lead to hurried and imperfect work on the part of the teacher, and this impairs the education received by the pupils. The broken down health of so many teachers of the deaf is the result of large classes. As to the number of years deaf children should receive tuition depends greatly on circumstances, but in no case should it be less than ten. Hearing children at public schools receive from ten to fifteen years' instruction, and surely deaf children, with the principal avenue of instruction forever closed to them, should have the same allowance of time in which to complete their education. Another thing to be taken into consideration is the vast mental difference between a hearing and a deaf child when they enter school. When a deaf child enters school he knows little, if anything, of the language of words. He can seldom write his own name or make a single request in language. It takes him at least four years to know as much language as a hearing child does when he enters school. If these four years were added to the number of years a hearing child is under instruction, it would give an approximate idea of the number of years required for the tuition of a deaf child.

Miss Mary Bull: There should be fewer pupils in the junior classes than in the senior, as in the former more time has to be given to each individual than in the latter. However, much depends on good classification, the pupils' ability, early training, etc. A junior teacher cannot do justice to more than twelve or fourteen pupils at most; ten years' tuition, in special cases twelve, ought to be allowed. Children who have all their faculties have that length of time at school. How much more so, then, these deprived of hearing—the most important.

Mr. D. J. McKillop: I think that fifteen beginners, of which my class consists in one division, is a suitable number, they being naturally bright and ten years old and upwards. If they are dull, ten ought to be in a class. I think it is a fatal mistake for such beginners to be pushed too much in both learning and writing, as they will have many mistakes in sentences since their minds are so undeveloped they often become discouraged But they understand very well if they go slowly and have everything explained clearly. Then they can make sentences as they feel encouraged to do so. Pupils ought to be allowed ten years here. Some require twelve.

Miss Ada James: I think the time should be extended Deaf and dumb children have no language when they first come to school, and we know it is very hard for them to acquire it. They should be kept at school at least ten years

A CONVENTION OF GRADUATES.

After the close of the regular session in June, a convention of old pupils was held at the Institution, commencing on the 19th and continuing four days. Over one hundred and seventy deaf men and women, some still young, others middle aged, came back to the place where they had learned to read and write, the duties of life, and their resp nsibilities to their Creator and their fellow men. It was an eminently respectable gathering. All were well dressed and looked as if they were prospering in life. In the reading of prepared papers, talking over passed school days, interchanging ideas on general subjects and renewing old friendships, the time passed only too rapidly for most of them. They conducted their proceedings and themselves in a manner not one whit behind any gathering of hearing and speaking persons. All had kind words and gratitude for those who had been instrumental in providing for and enabling them to obtain an education. The happy, intelligent demeanor of those assembled justified all the expenditure that has been made by the province for the benefit of the deaf and dumb within its borders. You will find herewith in tabulated form the names of a large number of our old pupils, the avocations they are following and where they are now. It was impossible to trace some of them as they have removed to other places, but the information here given will be interesting.

Artists—

Halliday, E J	Harriston.
Kay, Wm	Oil Springs.
Mason, A. W	Toronto.

Bookbinders —

Allen, P	Toronto.
Bryce, Wm	Hamilton.
Ellis, J	Toronto.
Green, R	Toronto.
Howe, Charles	Toronto.

Brassfitters—

Thompson, T	Hamilton.

Bakers—

Crozier, F	Westport.
Davidson, H	Kingston.
Messier, A.	Ottawa.
Saunderson, R	Cobourg.
Whealy, H	Toronto.

Bailiff—

Magee, W	London.

Butcher—

Terrell, Jno	Toronto.

Brushmakers—

Clench, W. H	Kingston.
McGillivray, N	Toronto.

Barber—

Murdock, Wm	Bellwood.

Cigar-Makers—

Dewar, A	St. Thomas.
McIntyre, E	London.

Copyist—

McCauly, M	Kincardine.

Carpenters—

Brooks, E. J	Brighton.
Conklin, E	Kingston.
Jackson, J. J	Gilby, N. Dak.
McKenzie, J	Glammis.
McCormick, T.	Trenton
McGlashan, T	Hamilton.

Clerks—

Ford, F	Hamilton.
Fuller, A	Stratford.
McRae, R. W. R	Kingston.

Cabinetmakers—

Smith, W. W.	Lanark.
Yack, G	Cargill.

Carriage-Makers—

Hammell, Wm	Arkwright.
Sutton, R.	Brantford.
Schnell, H	Zurich.

Coopers—

Meeks, Jno.	Plevna.
Sours, D.	Northfield Centre.

Domestic Servants—

Baptie, A.	Lakefield.
Lamonthe, C.	Ottawa.
Mason, E	Toronto.
Patterson, M	Toronto.
Theakston, M	Raglan.

Dressmakers—

Baker, L.	Woodlands.
Boyd, M	Duluth.
Cunningham, M	Oakville.
Campbell, M	Chatham.
Calvert, F	Hornings Mills.
Evans, S	Lansdowne.
Fuller, M	Mitchell.
Foulds, S.	Brantford.
Grogan, M E	Pakenham.
Lafferty, M	Windsor.
Lafferty, S	Windsor.
Pettiepiece, E	Winnipeg.
Pettiepiece, M.	Winnipeg.
Perry, A	Cobourg.
Rape, C	Landsdowne.
Steel, M.	Waterford.
Vallance, B.	Woodlands.
Wannamaker, L	Eldorado.

Domestic Occupation—

Andrews, M	Owen Sound.
Averell, S	Newton Robinson.
Bradshaw, A.	Flinton.
Black, M	Dungannon.
Borthwick, M	Ottawa.
Bryce, L.	Byron.
Bassett, S	Proga.
Barclay, C.	Allanford
Burke, J	Toronto.
Brown, C	Mount Forest.
Brown, M	Mimosa.
Byers, S.	West Corners.
Brown, E	Erin.
Birney, E.	Elora.
Baker, L	Vallentine.
Couse, J	Fingal.
Cahill, C.	St. Eugene.
Crosby, E.	St. Eberts.
Cummings, L.	Dunlop.
Campbell, A	Flinton.
Campbell, M	Duart.
Campbell, S	Gordon.
Elliott, E	Toronto.
Elliott, L	Toronto.

Evans, E	London.
Earl, S	Lansdowne.
Francis, A	Huntsville.
Forsyth, L	St. George.
Fuller, F	Warsaw.
Grace, M. E	Waterford.
Gray, Mary	Metcalfe.
Guin, E	Cadmus.
Gilchrist, A	Eskdale.
Grant, E	Virden, Man.
Gay, M	Guelph.
Henry, L. J	Toronto.
Herrington, B	Russell.
Hoggard, H	Londesborough.
Haines, C	Chesterville.
Henderson, M. E	Paris.
James, L	Oshawa.
Knight, N	Caledon.
Lancaster, A	Port Granby.
Laurence, B. A	Creemore.
Lucas, H	Mandamin.
Lentz, C	Snyder.
Moore, L	St. Mary's.
Montgomery, H	Goodstown.
Mathewson, A	Komoka.
Moore, C	Sebringville.
Munro, M. L	Midhurst.
McPhee, G	North Portal, Man.
McCullough, M	Leadbury.
McKillop, B	Duart.
McLean, J	L'Amable.
McFarland, A	Forest.
McNab, J	Renfrew.
McWhinney, R	Maple Hill.
McCollough, E. M	Brussels.
Noyes, J	Durfield.
Nahrgang, M	New Hamburg.
Nahrgang, L	New Hamburg.
Phoenix M	Toronto.
Porter, M	Paisley.
Queen, E	Dromore.
Rose, A	Russell.
Rice, C	Fullerton.
Robinson, L	Bobcaygeon.
Rea, M	Mimosa.
Reynolds, E	Hilton.
Stewart, A	Felton.
Steel, E	Waterford.
Smith, M	Wenton.
Stepler, M	Sebringville.
Vallance, C	Woodlands.
White, Mary	Bewdley.
White, E	Charing Cross.
Watt, M	Guelph.
Wolfe, B	Palmerston.
Wilkinson, H	Toronto.
Zingg, E	Hanover.

Engravers—

Rhodes, Jno	Toronto.

Fancy Worker—

McMurray, L	Detroit.

Farmers—

Alexander, D	Lumley.
Aivry, J. R	Ospringe.
Armstrong, K	South March.
Averell, S	Newton Robinson.
Adams, E	Owen Sound.
Bayne, D	Merivale.
Barton, A	Langton.
Bowen, A	Penville.
Bowlby, C	Simcoe.
Bridgeford, G	Dundas.
Barthel, E	Kansas, U. S.
Black, W	Dungannon.
Brown, T	Erin.
Buck, James	Mount Salem.
Baragar, Wm	Maynooth.
Beard, W. J	Tecumseth.
Beals, A	Luther.
Braithwaite, J	Carluke.
Brenzel, A	Hanover.
Bagshaw, H	Big Lake.
Calder, N	Bates, Man.
Campbell, A	Fernhill.
Channon, A	Dyers Bay.
Channon, J	Dyers Bay.
Croizier, Thos	Hagersville.
Clark, Arthur	Aurora.
Cahill, Patrick	St. Eugene.
Chamberlain, G	Port Royal.
Cummings, P	Mallory.
Campbell, D	Goderich.
Coxhall, J. R	Napanee.
Chantler, J	Woodstock.
Dean, J	Sandhill.
Douglas, G	Onondaga.
Dickson, G. A	Purbroke.
Durand, R	Canifton.
Douglas, J. B	Listowel.
Ducedre, J	Big Point.
Everingham, J	Bloomington, Ill.
Emery, W. J	Peterborough.
Fletcher, W. N	Houseys Rapids.
Farrell, C. E	Dalston.
Featherston, J	Waterdown.
Fleming, J	Newbury.

Gray, Alfred	Metcalfe.
Grant, G	Komoka.
Griffeth, A	Springbank.
Gee, J. W	Duncliff.
Gormon, D	Chatham.
Gustin, G. W	Mount Forest.
Garland, W. H	Ashton.
Gray, W. S	Port Elgin.
Hoy, R	Avonton.
Henderson, J	Ethel.
Hadden, D	Sarnia.
Hunter, G. F	Burk's Falls.
Hodgins, L. M	Diamond.
Henderson, J A	Talbotville.
Harmer, Chas	Bright.
Hornsby, J	Penetanguishene.
Hurl, T	Warsaw.
Hinton, Jno	Kilbride.
Ince, Henry	Manitoba.
Joice, R	Manitoba.
Johnson, F W	Chatham.
Johnson, F	Charing Cross.
Keyser, S	Springbank.
King, John	New Carlow.
Kelley, J. A	Glen Meyer.
Kirby, Jno.	Oxbow, Man.
King, Jno	Raglan.
Kidd, J. W	Pembroke.
Lowry, T	Midland.
Lockhart, A	Manitoba.
Lennox, D J	Phelpston.
Lang, D. W	Arnprior.
Deabry, D	South Douro.
Lentz, H	Snyder.
Muller, Wm	Elmira.
Muller, B.	Elmira.
Murphy, M	South March.
Middleton, Thos.	Hornings Mills.
Murray, M	North Augusta.
Murphy, D.	Carionbrook.
Morrison, A	Daywood.
Moore, S	Seaforth.
Moore, Jas.	Seaforth.
McCormick, Alex.	Charing Cross
McCullough, D	Clevering.
McKenzie, R.	Glammis.
McKenzie, K.	Duluth, Minn.
McIntyre, D	Fingal.
McIntyre, Dugald	Fingal.
McDonald, Geo.	Uptergrove.
McLaren, G.	Osgoode.
McLaren, Chas	Kenmore.
McLaren, A.	Kenmore.
McRae, M	Beaverton.
McKenzie, R	New Durham.
McLean, H	Durham.
McQuiggie, W. H.	Blairton.

McNaughton, D.	Wroxeter.
McCraig, R.	Dungannon.
McEwen, Jos	Billings' Bridge.
McCallum, Neil	Gladstone.
McDonald, Alex	Uptergrove.
Nahrgang, I	New Hamburg.
Noyes, Jno	Denfield.
Noyes, Andrew	Denfield.
Newell, J. R.	Milton West.
Nahrgang, O	New Hamburg.
Ormiston, J	Raglan.
Pincombe, R.	Poplar Hill.
Pincombe, W.	Poplar Hill.
Pincombe, J	Poplar Hill.
Pugsley, S	Cheapside.
Porter, A. R	Banda.
Pettit, S	Stony Creek.
Quinlan, Wm.	Stratford.
Riddle, F	Box Grove.
Robson, J	Leamington.
Rousehorn, G.	Perth Road.
Rutherford, Wm.	Rockton.
Robinson, R. J.	Kincardine.
Read, Alex.	Read.
Roberts, H. T.	Bornholm.
Rodgers, Jno.	Midland.
Stewart, Wm.	Banda.
Spinks, F.	Blackstock.
Sissions, R.	South March.
Shelp, T	Russell.
Smith, Wm.	Shakespeare.
Simmons, M	New Durham.
Stegmuir, C	Simcoe.
Stegmuir, D.	Simcoe.
Speer, E.	Manitoba.
Stephen, A.	Riverside.
Shearer, S. A	Dromore.
Stewart, Jas.	Sandpoint.
Trachsel, J.	Skakespeare.
Thackaberry, Wm	Carleton Place.
Turrell, D	Florence.
Tone, J.	Dakota.
Thompson, Wm.	Thamesville.
VanLuven, A. P	Morven.
Vallance, R	Woodlands.
Willis, R. W.	Orillia.
Wark, Wm.	Sarnia.
White, J.	Bewdley.
White, Alex	Bewdley.
Walton, J. W.	Woodstock.
White, A	Charing Cross.
White, J. C	Charing Cross.
White, E	Charing Cross.
Woods, P.	Chesterville.
Wright, T.	Newcombe Mills.

Wright, W. J.	Newcombe Mills.
Wolfe, W. J	Arkona.
Watson, R.	Avonbrook.
Young, G	Corbyville.
Young, J.	Corbyville.

Glass Stainers—

Elliott, C.	Toronto.

Gardener—

Madden, M.	California.

Ice Merchant—

Clark, R.	Niagara Falls.

Lock Maker—

Chute, E.	Worcester, Mass.

Lithographer—

Feast, A.	Boston, Mass.

Lumberman—

Labelle, A.	Whitney, Mich.

Laborers—

Alexander, A. C	Brighton.
Baines, S.	Belgrave.
Darue, S.	Sarnia.
Foristall, J.	Cornwall.
Hill, T.	Toronto.
McCoy, James	Belleville.
Purchel, P.	Silver Islet.
Sloan, W. E.	Milton.

Moulders—

Ball, E	Windsor.
Corbett, Wm	Owen Sound.
Harris, F. R.	Toronto.
Pettiford, C	Guelph.

Mason—

Goodbrand, J	Ancaster.

Machinists—

Bradshaw, T.	Toronto.
Lloyd, J.	Brantford.
Mason, H.	Toronto.
McLaren, T.	Brantford.

Married—

Mrs. Alexander	nee	Miss	Brown.
" Braven	"	"	McCallum.
" Beemer	"	"	Almas.
" Boughton	"	"	Fetterly.
" Bolduc	"	"	Terrell.
" Cotterell	"	"	Flight.
" Darue	"	"	Morrison.
" Ellis	"	"	Gray.
" Flynn	"	"	Brown.
" Fraser	"	"	Johnson.
" Featherston	"	"	Hamilton.
" Garland	"	"	Russell.
" Gottlieb, H	"	"	Plate.
" Gottlieb, E	"	"	McCallum.
" Gustin	"	"	Noyes, M.
" Gee	"	"	Noyes, L.
" Hoy	"	"	Leitch.
" Jefferson	"	"	Beamish.
" Kiddle	"	"	Hoffman
" Keyser	"	"	Perie, I.
" Lloyd	"	"	Kent.
" Liddy	"	"	L'Herault.
" Mason, A W.	"	"	Lewis.
" Mason, H.	"	"	Bowen.
" Moore	"	"	Conkwright.
" McDermid	"	"	Lorenzen.
" McLaren	"	"	McEwen.
" McEwen	"	"	Herrington.
" Noyes	"	"	Gray.
" Oxtoby	"	"	Moore.
" Ormiston	"	"	McLaren.
" Pettiford	"	"	Hunt.
" Pincombe	"	"	Sours.
" Smith	"	"	Nolan.
" Sutherland	"	"	Murphy.
" Stepler	"	"	McMordie.
" Stegmuir	"	"	Morrison.
" Smith	"	"	Feast.
" Terrell	"	"	Fortier.
" VanLuven	"	"	Miller.
" Wilson	"	"	Swift.
" Wheeler	"	"	Kent.
" White	"	"	McKay.
" Watson	"	"	Hunter.
" Young	"	"	White.
" Dark	"	"	Flemming.
" Phillips	"	"	Crosby.
" Hodgins	"	"	Mick.
" Noyes	"	"	Gray.

Nun—

Lang, C	Hamilton

Photographers—

Ball, B	Detroit.
Gates, J. A	Toronto.

Painters—

Beemer, J. G	Simcoe.
Frank, B	Strathroy.
Gallagher, J	Kingston.
Mosher, J	Hamilton.
Munro, A	Manitoba.
O'Neil, J	Hamilton.
Oxtoby, J	Ballantrice.
White, J.	St. Marys.

Packers—

Grant, H	Hamilton.

Printers—

Acheson, H	Boston, Mass.
Braven, J. A	Buffalo.
Cook, J. R.	Winnipeg.
Duncan. J	Winnipeg.
Fisher, Jno	Chatham.
Hollis, A	Berlin.
Liddy, W	Winnipeg, Man.
Lynch, M	Chatham.
McKay, A	Windsor.
McIntosh, A. A.	Winnipeg, Man.
Pickard, C.	Toronto.
Peake, J. J	Astoria, Wash. Ter.
Patrick, J	Carp.
Ryan, C	Woodstock.
Reeves, G	Lindsay.
Sutherland, A	Detroit.
White, W	Chicago, Ill.

Saw Mill Workers—

Fraser, A.	Pembroke.
Kimmerly, G.	Deseronto.
Morrison, D	Collingwood.
Milentz, C.	Pembroke.

Shoemakers—

Baizana, J	Ottawa.
Blue, D	Dutton.
Brown, B.	Carluke.
Byrne, J. R	Hamilton.
Beattie, S	Norval.
Bloom, D	Glencoe.
Chantler, Jas.	Woodstock.
Denee, J. U.	Clarks Mills.
Earl, J.	Brockville.
Freeman, W	Dromore.
Flynn, Jno.	Toronto.
Fraser, P	Toronto.
Faubert, J	Montreal.
Fitzsimmons, J	Glammis.
Gottlieb, E.	Berlin.
Gottlieb, H	Brantford.
Gould, J. S.	St. Mary's.
Golds, Chas.	Milton.
Hazelton, Thos.	Delta.
Hunt, F.	Rockport.
Isbister, J. A	Lakefield.
Jordan, T.	Dublin.
Johnson, T.	Belgrave.
Kochler, L.	Wellesley.
Larkins, W. B	Boston, Mass.
Leblanc, M.	The Brook.
Lyon, A.	London, Eng.
Moorand, S.	Ottawa.
McIsaac, Jno.	Lynedoch.
Nurse, Wm.	Belleville.
Robbins, E O	Flinton.
Rose, Wm	Milton.
Smith, A. E	Brantford.
Stenabaugh, W	Brantford.
Sepner, A E.	Windsor.
Taylor, J	Singhampton.
Waggoner, A. S	Milton.
Wark, W.	Sarnia.
Wintemburg, A	New Hamburg.
Wilson, Isaac	Chicago, Ill.
Wallace, Wm	Merriton.

Seamstress—

McRitchie, P	Berlin.

Tailors—

Agnew, E	Clinton.
Green, T.	Vancouver, B.C.
Hanson, R.	Kingston.
Merchand, E	St. Louis, Mo.
Mortimer, C.	Hamilton.
McCullough, E	Brussells.
McPherson, R	Brantford.
O'Boyle, D.	Montreal.
Wheeler, F. N	Buffalo.

Teamster—

Smith, A	Brantford.

Teachers—

Bull, M	Belleville.
James, A	Belleville.
McKillop, D. J	Belleville.

Wood Carvers—

Busch, S	Kingston.
Dark, D	Toronto.

Wire Workers—

Brockbank, H	Hamilton.
McLaren, A. J	Brooklyn, N.Y.

Woolen-Mill Workers—

Greely, J	Kansas City.
Kennedy, M	Mitchell.
Reid, J	Dundas.
Malone, P	Almonte.

Wood Turner—

Riddle, R	Toronto.

Watchman—

Johnson, J. C	Barrie.

Unclassified—

Beane, E	Prescott.
Barler, F	Carthage.
Burchannon, J	Donegal.
Burchart, G	Owen Sound.
Brian, L	Carleton Place.
Benway, C	Toronto.
Cowan, A. H	London.
Connell, M. F	Windsor.
Campbell, W. J	Toronto
Carscadden, W. J	St. Ives.
Cotton, M	Gananoque.

Culbert, J. H.	Brantford.
Crawford, M. A.	Brampton.
Canard, Wm	Oshawa.
Cook, Ann.	Holmesville.
Clapp, J. H	Picton.
Crittenden, A.	Vachill.
Carmichael, H	Queen's Hill.
Cody, E.	Oakwood.
Drum, M	Kinmount.
Denison, J	Kingston.
Downey, J. C.	Maynooth.
Dank, R.	London.
Dyke, B.	Ottawa.
Davies, M. E.	Georgetown.
Donal, M. A	Remington.
Denike, M. J.	Shannonville.
Davies, Chas	Detroit, Mich.
Fallion, C.	Trenton.
Fry, E.	Dungannon.
Flannagan, Wm	Guelph.
Gilmore, Ann	Whitby.
Gilipepie, F. H.	Grimsby.
Gagnee, E.	Montreal.
Grant, Charllota	Hermon.
Haggard, E. J	Campbell's Cross.
Hill, M.	Woodstock.
Hurd, W. J.	Woodstock.
Heckler, C. D	St. Clements.
Hazelton, M	St. Catharines.
Hunter, M.	Toronto.
Hinman, N.	Dundonald.
Hubbard, T.	Harriston.
Hurd, T. H.	Warsaw.
Howison, A. E	Brockville.
Illman, F. C	Haliburton.
Jodoin, W	Windsor.
Jarvis, M	Wiarton.
Jacobs, J. D	Port Perry.
Jones, I.	New York, N.Y.
Krause, H. B	Crediton.
Kruger, A	Elmwood.
King, E	Ravenshoe.
Lewis, C.	Pembroke.
Little, A.	Lockton.
Lang, W. H	Orono.
Lafferty, F.	Napanee.
Minaker, W. J	Milford.
Mitchell, H	Brockville.
Mason, A.	Hyde Park.
Morgan, J. E.	Kincardine.
Moran, P	Wyoming.
Merrington, W. H	Prescott.
Murphy, M. A	Hamilton.
Muir, A	Toronto.
Martin, I	Hartington.
Masury, P.	Point Albino.

McLellan, E	Parkhill.
McCrimmon, D.	Williamston.
McDowell, M. E.	Stonegh.
McCormick, T. A	Trenton.
McEllensborough, A.	Port Hope.
McDonald, A.	South Duro.
McLean, A.	Rodgersville.
McDonald, F.	St. Raphael.
McConnel, J. E.	Bracebridge.
McCallum, G.	Staffordville.
McQuarrie, M.	Blyth.
Normon, H	Carmilla.
Price, M. A.	Hamilton.
Phillips, L	Ottawa.
Quinn, M	Kempville.
Reid, S	London.
Runnells, E	Warkworth.
Richardson. M	Pembroke.
Rochester, B	Rochesterville.
Rutherford. A	Orillia.
Robinson, E	St. Catharines.
Riodan, Wm	Toronto.
Sheehan, D	South Duro.
Stewart, J. B	Damascus.
Smith, M	St. Mary's.
Simon, E	Hiawathia.
Stauffer, J	Plattsville.
Shuler, J. R	Beachville.
Thompson, S	London.
Taylor, J. H	Hamilton.
Vicars, R.	Cannington.
Vincent, H. T.	Port Hope.
Warren, I	Mallorytown.
Wright, A	———
White, H.	Toronto.
Walker, S. R.	London, Eng.
Willoughby, R	Georgetown.
Whenham, C. A.	Londesborough.

RECAPITULATION.

Artists	3
Bookbinders	5
Brassfitters	1
Bakers	5
Bailiffs	1
Butchers	1
Brushmakers	2
Barbers	1
Cigarmakers	2
Copyists	1
Carpenters	6
Clerks	3
Cabinetmakers	2

RECAPITULATION —*Continued.*

Carriagemakers	3
Coopers	2
Domestic servants	5
Domestic occupation	85
Dressmakers	18
Engravers	1
Fancy workers	1
Farmers	161
Glass stainers	1
Gardeners	1
Ice merchants	1
Lockmakers	1
Lithographers	1
Lumbermen	1
Married	45
Nun	1
Photographers	2
Painters	8
Packers	1
Printers	17
Sawmill workers	4
Shoemakers	41
Seamstress	1
Tailors	9
Teamster	1
Teachers	3
Woodcarvers	2
Wireworkers	2
Woollenmill workers	4
Woodturner	1
Watchman	1
Unclassified	105

VISIT OF THE GOVERNOR-GENERAL.

On the 29th of May we were honored by a visit from His Excellency, Lord Aberdeen, the Governor-General, accompanied by Captain Hon. Majorbanks, A.D C., Captain Urquhart, A.D.C., Hon. McKenzie Bowell, Senator Reid, H. Corby. M.P., W. H. Biggar, M.PP., Sheriff Hope, Mayor Walmsley, T. Ritchie, Esq., Rev. E. N. Baker, and Police Magistrate J. J. B. Flint. Lord Aberdeen's visit was looked forward to with great interest by all connected with the institution, and his favorable opinion of our work generally was desired. For nearly four hours His Excellency watched the deaf children at their various exercises in the several class-rooms, questioned the superintendent and teachers upon the methods employed, talked to the pupils through interpreters, inspected every department of the institution, showing through the long and fatiguing proceedings the keenest attention in everything that was said or shown to him. He frequently stopped to express his admiration of the equipment of the building or his interest in the work of the children. At the conclusion of the inspection the distinguished visitor was conducted to the chapel where were assembled 257 pupils, teachers, officers and other friends. To a formal address of welcome given as part of the programme, His Excellency was pleased to remark : "The address with its kindly and graceful utterances gives me very great pleasure. I have been looking forward to the opportunity of visiting this institution, and I can assure you that although I expected to see a great deal that would surprise and gratify, yet the reality has surpassed my expectations. I am therefore very much indebted to those who arranged that I should have an opportunity of paying this visit, and I wish to remind you that it is from some of the most advanced and leading pupils that the invitation may be said to have come, endorsed of course by Mr. Mathison and his colleagues. Therefore, I thank you for the pleasure and the advantage which it has been to me to witness something of the great work that is going on here. You will easily understand that it is not only a personal satisfaction and pleasure to me to have gained some acquaintance with this institution, but clearly it is desirable—nay, indeed the duty of the Governor-General to make acquaintance as soon as possible with the principal features of the great educational work of Ontario and of Canada as a whole. There is another reason why I am glad to have been here to-day, and that is because it has furnished an occasion of paying a visit to the fair city of Belleville, with which I have been delighted, not only because of the external attractions of the place, but still more because of the wonderful cordiality with which, as the representative of the Queen, I have been received, and also of the personal expressions of good will and welcome which accompanied my reception. I observe that the motto on the programme is, 'The greatest happiness is found in making others happy,' and of course the institution is founded to enable you to carry out this noble mission in life in an effectual manner. Moreover, I trust you will all feel that the education you gain here is especially valuable because it will enable you to contribute to your own livelihood. It is an honorable thing to secure self-dependence, as far as possible. I remember once I wrote an article for a magazine for which I received £5. I never was so pleased with any £5 note as I was with that one. I do not mean to boast about that incident, of course, but I wish to draw your attention to the satisfaction to be gained by earning something for yourselves. There is another point I wish to mention, and that is the making of the right use of the instruction given. This involves much attention and also patience on your part as well as, I am sure, on the part of your instructors. You are therefore developing character. The exercise of patience and self control increases the qualities of an individual's character, and you are therefore gaining not only the art of writing and of speaking, but you are unconsciously forming character, and that of course is of the utmost value. So therefore, from all points of view the existence of this institution is a cause of great thankfulness—not only on your part, but on the part of the whole people of the country. I am only sorry that the visit has been so short, but it is quite enough to give me a very favorable impression of what is being done here, and when I speak of impressions, I refer also to your outward aspect. You look cheerful, happy and well fed. I am very glad you seem to agree with that sentiment, and when you go home for the holidays I think your parents and friends will be all the more glad to see you because you are looking well. You have mentioned Lady Aberdeen, and I value the kindness of your reference to her. I can assure you it would have been a great happiness to her to have been here to-day, and when I tell her of what I have seen, I am sure she will agree with me that if you send us another invitation we shall accept it. And now we shall say farewell and I hope you will have a happy time, and that you will be thankful for this institution, and that the whole country will feel the benefit of it through you." In conclusion Lord Aberdeen said : "I must finish with a sentence with which I ought to have begun my remarks. Now, please watch me closely," and His Lordship signed to the astonished children the words, "I am pleased to see you." This was given, not in the manual alphabet, letter by letter, but in the sign language His Lordship had seen that afternoon for the first time, but so cleverly did he do it that the children caught his meaning at once and broke into a wild cheer.

The Gibson Hospital.

During the visit of His Excellency, Lord Aberdeen, he was requested to name the new hospital to which he kindly assented. In doing so he said : "I have great pleasure in complying with the request made to me. I feel it a great privilege to take part in the inauguration of this handsome building, and in doing so, to name it by the designation which has been suggested by Mr. Mathison. I have therefore to request that this building be known hereafter and for all time as 'The Gibson Hospital.'"

The Class Rooms.

The visit of Lord Aberdeen occurred at the time of our usual annual examination by an outside examiner, consequently it was omitted this year, but just prior to His Excellency's coming, however, we had our institution examination extending over a week in each class, and the results were quite encouraging and showed that good teaching had been done in every class. Each pupil's was committed to paper, the results tabulated and the papers forwarded to the parents for perusal and preservation. The progress made, as evidenced by the results, together with a teacher's report on each scholar's proficiency, was taken into consideration in promoting and classification for next year's labors. The classes as remodelled have commenced the studies as outlined in the school course. The foregoing refers more particularly to the ordinary classes. The articulation classes may be considered special in a sense, and in these also substantial improvement was noticeable. All the teachers in the institution seemed imbued with the responsibilities of their positions, and deserve commendation for services faithfully performed.

Mr. W. J. Campbell and Mr. Geo. F. Stewart, both of whom have had a lengthened and successful experience in public school work, have been added to our staff of teachers. They are interested in the work, and their future labors promise to be satisfactory. Miss Edith M. Yarwood, a young lady of ability, has been engaged to teach drawing, and the series of drawing books authorized by the Education Department of Ontario have been introduced, and will be used hereafter in the class.

The death of Mr. J. B. Ashby took from us a faithful conscientious teacher, one who was never found wanting. Being deaf himself, for those similarly afflicted he had the greatest sympathy, and no labor was felt by him to be too arduous could he but advance their interests. Thoroughly straightforward in all his dealings and capable beyond most men in ordinary life, he has left behind in the hearts of his pupils, associates and old friends, an enduring monument of affectionate regard.

Industries.

Our industrial departments have been fairly successful during the year, and the pupils who were working all day made, for the most part, satisfactory progress. In the sewing room the girls who were under instruction in dressmaking and tailoring were reported as being anxious to learn; several of them gave encouraging signs of future usefulness. In the shoe shop the boys were kept steadily employed without urging them on for quantity at the expense of quality and one young man has just left us to engage in business for himself. Two boys were taught the baker's trade; one of them has employment at it near his home, the other has been ill and unable to work, but when he recovers his usual health, will be able to take a situation. One of the printer boys of last session has a position in a country office and is doing well.

Health of Pupils.

During the past year the health of pupils was not as good as we could have desired. We had an epidemic of measles, a few cases of scarlet fever, and a number of cases of typhoid fever. The day school opened, a little girl arrived among the others, complained of being ill, was put to bed, and the next morning gave umistakable evidences of having measles; from this one case, although she was isolated without delay, we had over one hundred other cases. Then we had five patients with scarlet fever, the disease being brought here in clothing from a home where it had been a few months previously, the session was closing when several cases of typhoid fever developed, and the ailing children were unable to go home with the others in June. Notwithstanding the unusual number who were ill at various times, it is a matter of sincere gratitude that there was only one fatality. The new hospital was ready just in time for the typhoid cases. With good medical attention, capable and careful nursing and handy hospital appliances, everything was favorable for the recovery of the sick children. The little girl, Theresa Noonan, up to the time of her illness, had been a strong, healthy child, but the fever, followed by abscesses on the brain, carried her off. Her mother and sister were with her for some days prior to her death, and were satisfied every endeavor had been made by all concerned to avert the calamity. She was a bright, lovable girl, one of five children from the same family, and a general favorite. We located the causes of our having measles and scarlet fever, but cannot satisfactorily account for the typhoid outbreak. It is generally supposed fever germs are communicated to the human system by drinking impure water, milk, etc. We use water from the city water works, and a well thirty-nine feet in the rock. An analysis of these waters was made by the authorities of the Provincial Board of Health, and in a letter from Professor Bryce, he stated: "There is nothing in either sample to indicate anything suspicious." Our milk supply has always been good. If the fever had been caused by the water there would in all probability have been a larger number of cases. The well from which the drinking water is obtained is forty yards from any tile, drain, or back sewer, is piped up to the top, the surface excavation cemented and the top protected in such a manner as to prevent surface drainage getting into it. Our sewers and water closets are flushed regularly, some of them several times each day. On the whole I am inclined to think the cause was temporary which could not be avoided rather than any permanent defect in our water supply or sewer arrangement.

Newspapers Received.

A great deal of profit and pleasure is afforded our pupils by the perusal of the various newspapers kindly forwarded to our reading rooms free of charge. We are indebted to the publishers of the following newspapers for favors:

Name.	Where published.	Name.	Where published.
Evening Times	Hamilton.	Niagara Falls Review	Niagara Falls.
Spectator	Hamilton.	Guide	Port Hope.
Daily Free Press	Winnipeg.	Courier	Trenton.
Free Press	Ottawa.	Hastings Review	Madoc.
Daily News	Kingston.	Advocate	Trenton.
Expositor	Brantford.	Rural Canadian	Toronto.
Economist	Shelburne.	Tribune	Deseronto.
Express	Colborne.	Telegraph	Palmerston.
Free Press	Acton.	Herald	Carleton Place.
Mercury	Guelph.	Canadian Churchman	Toronto.
Examiner	Peterborough.	Cornwall Freeholder	Cornwall.
Mercury	Renfrew.	Leader	Tara.
Despatch	Strathroy.	Echo	London.
Post	Thorold.	Enterprise	Colborne.
Banner	Dundas.	Reformer	Simcoe.
Enterprise	Collingwood.	Ensign	Brighton.
London Advertiser	London.	Sentinel-Review	Woodstock.
Clinton News	Clinton.	Courier	Embro.

NEWSPAPERS RECEIVED.—*Continued.*

Name.	Where published.	Name.	Where published.
Mirror	Meaford.	Farmers' Sun	Toronto, Ont.
Monitor	Meaford.	Rockwood Review	Kingston, Ont.
Star	Goderich.	The Silent Hoosier	Indianapolis, Ind.
Herald	Campbellford.	The Banner	Devil's Lake, N.D.
The Arrow	Burk's Falls.	Mute's Chronicle	Columbus, Ohio, U.S.
Whig	Kingston.	The Advance	Jacksonville, Ill., U.S.
Hepworth Journal	Hepworth, Ont.	Dakota Advocate	Sioux Falls, South Dak., U.S.
Thunder Bay Sentinel	Port Arthur, Ont.	Missouri Record	Fulton, Mo., U.S.
The Colchester Sun	Truro, N.S.	Colorado Index	Colorado Springs, Col., U.S.
The Silent Echo	Winnipeg, Man.	The Silent World	Philadelphia, Pa., U.S.
Deaf Mute Journal	Station "M.," New York City.	The Western Pennsylvania	Edgewood Park, Pa.
Deaf Mute Register	Rome, New York.	The British Deaf Mute	16 Howarth Place, Leeds, Eng.
Daily Paper for Our Little People	School for the Deaf, Rochester, N.Y.	The Sign	Salem, Oregon.
Silent Worker	Trenton, N.J.	The Optic	Little Rock, Ark.
Maryland Bulletin	Frederick, Md.	The National Exponent	Chicago, Ill.
Goodson Gazette	Staunton, Va., U.S.	The Idea	Jacksonville, Ill.
The Tablet	Romney, W.Va.	Companion	Faribault, Minn., U.S.
The Palmetto Leaf	Cedar Springs, S. C.	The Educator	Mount Airy, Pa
The Washingtonian	Vancouver, Wash.	Advocate	Malone, N.Y.
The Weekly News	Berkley, Cal., U.S.	The New Method	Englewood, Ill.
The Messenger	Talladega, Alabama, U.S.	The Pelican	Baton Rouge, La.
Kentucky Deaf Mute	Danville, Ky., U.S.	The Voice	Jackson, Miss.
Printers' Ink	10 Spruce St., New York.	The Silent Observer	Knoxville, Tenn.
Lone Star Weekly	Austin, Texas.	The Mirror	Flint, Mich.
Critic	Dubuque, Iowa.	Herald	St. Augustine, Fla.
The Mute Journal	Omaha, Neb.	The Times	Wisconsin.
The Star	Olathe, Kansas.	The Hawkeye	Council Bluffs, Iowa.
Desert Eagle	Salt Lake City.		
American Teacher	Boston, Mass.		

NOTE.—The "Canadian Churchman" is generously supplied by the Rev. Canon Burke, of Belleville.

MISCELLANEOUS

Thirty-two new pupils came at the opening of the present session.

We have 500 feet of 3 in. hose for use in case of fire ; we ought to have at least another 500 feet.

The outside woodwork of the main building ought to be painted next year, and if at the same time the brickwork was painted the whole would present an improved appearance.

The institution re-opened on Wednesday, the 19th of September, one week after the regular date. The change was made to escape the crowds of people coming to and returning from the Industrial Fair in Toronto.

Our farm and garden operations have yielded a good supply of hay, oats, potatoes and roots of various kinds. The fences about the grounds have been renewed and repaired to some extent, but more renewals and repairs will be necessary to put them in a satisfactory condition.

The want of a larger assembly room was made quite apparent during the meetings of the Provincial Sabbath School Association in Belleville recently. On one or two occasions we had several hundred visitors and when our pupils were all together, many of them were unable to gain admission to witness the exercises. A separate school building with a large hall is a necessity.

The Grand Trunk Railway, the Canadian Pacific Railway and the Central Ontario Railway continued their liberal arrangements in allowing pupils, officers and teachers double journey tickets for single fare during the summer vacation. Were it not for the concessions of the railway companies in regard to transportation a number of the children here would be unable to obtain the advantages of the institution.

During the year we had interested visitors from other schools for the deaf and they were welcome. Dr. P. G. Gillett, for thirty-five years the Superintendent of the Illinois Institution (the largest and one of the best in the world) and now the President of the American Association to Promote Speech to the Deaf, favored us by remaining here three days, during which time he visited and examined the pupils in every schoolroom, department and part of the institution. His good opinion, based upon what he had seen and heard, was very gratifying to all of us. Superintendent Swiler, of the Wisconsin School, and Hon. Mr. Graebner, of the State Board of Control, and Superintendent A. L. E. Crouter, of the Philadelphia Institution, also expressed themselves pleased with their visit.

The following named reverend gentlemen visited the children belonging to their denomination at various times during the session : Rev. Canon Burke, Right Rev. Monsignor Farrelly, V.G., Rev. E. N. Baker, Rev. J. L. George, Rev. R Marshall, and Rev. Father O'Brien. A number of the Roman Catholic children received their first communion in the church of their parents in Belleville. The rite of confirmation was administered in St. Thomas Church, Belleville, on Sunday evening, the 27th of May, by the Bishop of Ontario assisted by the Rev. Canon Burke. Among others were thirteen pupils of this school, previous permission having been given by their fathers and mothers. Rev. Canon Burke has always been faithful and untiring in his attention to the spiritual welfare of the pupils belonging to his communion, and prompt and regular in his visits. He otherwise takes great interest in the success of the institution.

To officers, teachers and employees generally I am indebted for willing co-operation in carrying on the good work of the institution, and to you as Inspector we are all under obligations for your kindly interest and prompt attention to matters concerning our welfare.

The statistical tables are appended herewith.

I have the honor to be, Sir,

Your obedient servant,

R. MATHISON,

Superintendent.

NATIONALITY OF PARENTS.

Name.	No.	Name.	No.
Canada	194	Germany	8
Ireland	17	United States	2
Scotland	19	Unknown	30
England	25		
Italy	......	Total	295

RELIGION OF PARENTS.

Name.	No.	Name.	No.
Presbyterian	68	Evangelical, German	1
Methodist	95	Mennonites	5
Church of England	46	United Brethren	1
Roman Catholic	52	Church of Christ	3
Baptist	16	Believers	1
Bible Christian	......	Unknown	4
Lutheran	3	Total	295

OCCUPATION OF PARENTS.

Occupation.	No.	Occupation.	No.
Agent	5	Clerk	2
Axemaker	1	Conductor	2
Blacksmith	7	Constable	1
Bookkeeper	1	Cattle and grain dealer	......
Butcher	3	Carter	2
Builder	1	Currier	1
Banker	1	Cheesemaker	1
Brickmaker	1	Contractor	1
Barber	1	Dressmaker	1
Basketmaker	1	Druggist	1
Cooper	2	Drayman	1
Carpenter	9	Engineer	2

OCCUPATION OF PARENTS.—*Concluded.*

Occupation.	No.	Occupation.	No.
Expressman	2	Physician	1
Farmer	118	Plasterer	.....
Grocer	2	Potter	1
Gardener	3	Second-hand dealer	1
Harnessmaker	2	Stoker	1
Hotelkeeper	2	Sailor	1
Housekeeper	2	Shoemaker	8
Lumberman	1	Switchman	1
Laundry maid	1	Steamfitter	1
Laborer	64	Teamster	1
Machinist	4	Teacher	2
Mason	3	Tailor	1
Minister	1	Wagonmaker	1
Merchant	3	Washerwoman	1
Moulder	.....	Watchman	1
Miller	3	Unknown	13
Navigator	1		
Painter	1	Total	295

AGE OF PUPILS.

Age.	No.	Age.	No.	Age.	No.
7	3	14	21	21	7
8	20	15	27	22	8
9	26	16	19	23	6
10	28	17	14	24	1
11	30	18	19	25	1
12	33	19	10		
13	15	20	7	Total	295

COUNTIES FROM WHICH PUPILS DURING THE YEAR CAME.

Counties.	No.	Counties.	No.
Brant	2	Monck	2
Bruce	8	Norfolk	6
Cornwall	4	Northumberland	5
Carleton	16	Nipissing District	1
Dufferin	2	Ontario	3
Durham	1	Oxford	11
Elgin	7	Peel	2
Essex	7	Perth	4
Frontenac	1	Peterborough	5
Grey	8	Prescott and Russell	11
Haliburton	2	Prince Edward	2
Haldimand	2	Renfrew	5
Halton	4	Simcoe	8
Hastings	25	Stormont, Dundas and Glengarry	5
Huron	11	Victoria	8
Kent	12	Waterloo	8
Lambton	9	Welland	1
Lanark	8	Wellington	8
Leeds and Grenville	8	Wentworth	9
Lennox and Addington	12	York	28
Lincoln	2	Parry Sound	3
Middlesex	8	Algoma District	1
Muskoka			
		Total	295

TOTAL NUMBER OF PUPILS IN ATTENDANCE FOR THE SESSION 1893-1894.

Males	158
Females	137
Total	29

COUNTIES FROM WHICH THE PUPILS IN RESIDENCE ON 30TH SEPTEMBER, 1894, WERE ORIGINALLY RECEIVED.

Counties.	Male.	Female.	Total.	Counties.	Male.	Female.	Total.
Algoma District	1	....	1	Lincoln	....	2	2
Brant	2	....	2	Ontario	1	2	3
Bruce	5	2	7	Oxford	5	5	10
Cornwall	4	....	4	Peel	1	1	2
Carleton	10	4	14	Perth	3	1	4
Dufferin	1	1	2	Peterborough	2	2	4
Durham	1	....	1	Prescott and Russell...	6	1	7
Elgin	3	3	6	Prince Edward	1	1	2
Essex	3	3	6	Renfrew	2	3	5
Frontenac	1	....	1	Simcoe	4	4	8
Grey	3	3	6	Stormont, Dundas and Glengarry	2	....	2
Haliburton	2	....	2	Victoria	2	6	8
Haldimand	1	....	1	Waterloo	3	5	8
Halton	....	4	4	Welland	....	1	1
Hastings	13	8	21	Wellington	4	4	8
Huron	4	5	9	Wentworth	3	5	8
Kent	7	4	11	York	13	12	25
Lambton	3	6	9	Muskoka District	....	1	1
Lanark	1	....	1	Parry Sound	1	1	2
Leeds and Grenville	4	....	4	Nipissing District	1	....	1
Lennox and Addington .	5	6	11				
Middlesex	2	4	6	Total	139	114	253
Monck	1	1	2				
Norfolk	4	2	6				
Northumberland	4	1	5				

NUMBER OF PUPILS IN ATTENDANCE EACH OFFICIAL YEAR SINCE THE OPENING OF THE INSTITUTION.

——	Male.	Female.	Total.
From October 27th, 1870, to September 30th, 1871	64	36	100
" 1st, 1871, " 1872	97	52	149
" 1872, " 1873	130	63	193
" 1873, " 1874	145	76	221
" 1874, " 1875	155	83	238
" 1875, " 1876	160	96	256
" 1876, " 1877	167	104	271
" 1877, " 1878	166	111	277
" 1878, " 1879	164	105	269
" 1879, " 1880	162	119	281
" 1880, " 1881	164	132	296
" 1881, " 1882	165	138	303
" 1882, " 1883	158	135	293
" 1883, " 1884	156	130	286
" 1884, " 1885	168	116	284
" 1885, " 1886	191	112	273
" 1886, " 1887	151	113	264
" 1887, " 1888	156	109	265
" 1888, " 1889	153	121	274
" 1889, " 1890	159	132	291
" 1890, " 1891	166	130	296
" 1891, " 1892	158	127	285
" 1892, " 1893	162	136	298
" 1893, " 1894	158	137	295

OCCUPATION OF PARENTS OF PUPILS ADMITTED SINCE THE OPENING OF THE INSTITUTION.

Occupation.	No.	Occupation.	No.
Accountant	2	Cheesemaker	1
Agent	6	Civil service	1
Axemaker	2	Clerk	5
Baggageman	1	Contractor	1
Baker	3	Conductor, railway	3
Blacksmith	24	Cigarmaker	1
Boarding-house keeper	1	Dealer in hides	1
Barber	1	Drayman	4
Boilermaker	1	Dressmaker	4
Bookkeeper	4	Doctor	2
Brakesman	1	Engineer	5
Bricklayer	2	Engineer, railway	3
Butcher	4	Farmer	443
Brickmaker	1	Fire insurance inspector	2
Brewer	2	Fisherman	3
Builder	1	Grocer	2
Barrister	1	Gaoler	1
Banker	1	Gardener	3
Basketmaker	1	Gunsmith	1
Brassfinisher	1	Harnessmaker	3
Carter	2	Housekeeper	2
Cab-driver	2	Hotelkeeper	1
Cabinetmaker	2	Ironmaker	1
Captain of schooner	1	Keeper of park	1
Carder	1	Laborer	191
Car inspector	1	Livery proprietor	3
Constable	1	Laundry maid	1
Cooper	4	Lumberman	6
Currier	5	Miller	6
Charwoman	1	Millwright	2
Carpenter	35	Miner	1
Carriagemaker	5	Minister	2

OCCUPATION OF PARENTS OF PUPILS ADMITTED SINCE THE OPENING OF THE INSTITUTION.—*Concluded.*

Occupation.	No.	Occupation.	No.
Moulder	2	Shoemaker	9
Machinist	6	Stagedriver	1
Maltster	1	Switchman	1
Marble-cutter	2	Stoker	1
Mason	6	Sailor	1
Manufacturer agricultural implements	2	Tavernkeeper	9
Mechanic	2	Tailor	1
Merchant	17	Teacher	10
Non-commissioned officer	1	Teamster	5
Navigator	1	Trader	2
Nurseryman	1	Weaver	1
Painter	10	Watchman	1
Peddler	1	Wagonmaker	1
Potter	1	Washerwoman	2
Storekeeper	1	Unknown	86
Steamfitter	1	Total	1,018

AGES OF PUPILS ADMITTED SINCE THE OPENING OF THE INSTITUTION.

Ages.	No.	Ages.	No.	Ages.	No.
4	1	14	45	23	6
6	24	15	55	24	5
7	138	16	40	25	6
8	142	17	40	26	5
9	112	18	36	27	3
10	74	19	26	30	1
11	78	20	17	36	1
12	66	21	11	Unknown	13
13	61	22	12	Total	1,018

CAUSES OF DEAFNESS.

Cause.	No.	Cause.	No.
Abscess	5	Gathering of the head	6
Accident	9	Inflammation of the brain	11
Affection of the ears	3	" ears	5
Bronchitis	4	" lungs	4
Burns	1	" pulmonary organs	2
Catarrh	4	Inflammation of the spinal organs	1
Canker	1	Measles	29
Cerebro spinal meningetitis	22	Mumps	5
Cholera	1	Paralytic stroke	1
Cold	40	Rickets	1
Congenital	402	Scabs	1
Congestion of the brain	7	Scald	1
Diphtheria	4	Scald head	4
Dysentery	1	Shocks	5
Drank carbolic acid	1	Sickness undefined	27
Exema	1	Spinal disease	48
Falls	22	Swelling on the neck	1
Fever, rheumatic	1	Teething	15
" bilious	4	Water on the brain	7
" brain	26	Whooping cough	10
" intermitttent	2	Worms	4
" scarlet	71	Causes unknown or undefined	118
" spinal	20	Sunstroke	1
" malarial	1	Vaccination	1
" typhus	5	Bealing	1
" typhoid	9	Scrofula	1
" undefined	25	Sore throat	1
Fits	8		
Gathering of the ears	7	Total	1,018

DATE OF DEAFNESS AFTER BIRTH.

——	No.	——	No.
Under 1 year of age	107	Between 10 and 11 years	5
Between 1 and 2 years	116	" 11 " 12 "	2
" 2 " 3 "	106	" 12 " 13 "	2
" 3 " 4 "	57	" 13 " 14 "	4
" 4 " 5 "	36	" 14 " 15 "	2
" 5 " 6 "	27	Unknown at what age they lost their hearing, but not born deaf	112
" 6 " 7 "	14	Congenital	405
" 7 " 8 "	11		
" 8 " 9 "	3		
" 9 " 10 "	9	Total	1,018

RELATIONSHIP OF PARENTS.

First cousins	57
Second "	23
Third "	18
Distantly related	23
Not related	871
Unknown	26
	1,018

COUNTIES FROM WHICH THE PUPILS IN RESIDENCE DURING THE YEAR UP TO SEPTEMBER 30TH, 1894, WERE ORIGINALLY RECEIVED.

Counties.	Male.	Female.	Total.	Counties.	Male.	Female.	Total.
Algoma District	1	....	1	Hastings	14	11	25
Brant	2	......	2	Haliburton	2	....	2
Bruce	5	3	8	Huron	5	6	11
Carleton	10	6	16	Halton		4	4
Cornwall	4	....	4	Haldimand	2	....	2
Durham	1	....	1	Kent	8	4	12
Dufferin	1	1	2	Lambton	3	6	9
Elgin	3	4	7	Lanark	3	5	8
Essex	3	4	7	Leeds and Grenville	7	1	8
Frontenac	1	....	1	Lennox and Addington	6	6	12
Grey	3	5	8	Lincoln	....	2	2

COUNTIES FROM WHICH THE PUPILS IN RESIDENCE DURING THE YEAR UP TO SEPTEMBER 30TH, 1894, WERE ORIGINALLY RECEIVED.—*Concluded.*

Counties.	Male.	Female.	Total.	Counties.	Male.	Female.	Total.
Monck	1	1	2	Simcoe	4	4	8
Middlesex	4	4	8	Stormont, Dundas and Glengarry	3	....	3
Norfolk	4	2	6	Victoria	2	6	8
Northumberland	4	1	5	Waterloo	3	5	8
Nipissing District	1	......	1	Welland	.....	1	1
Ontario	1	2	3	Wellington	4	4	8
Oxford	5	6	11	Wentworth	3	6	9
Peel	1	1	2	York	14	14	28
Perth	3	1	4	Muskoka District	......	2	2
Peterborough	3	2	5	Parry Sound	2	1	3
Prescott and Russell	9	2	11				
Prince Edward	1	1	2	Total	158	137	295
Renfrew	2	3	5				

NUMBER OF DEAF-MUTE FAMILIES REPRESENTED.

2 families contained	5	10
4 "	4	16
12 "	3	36
68 "	2	136
820 "	1	820
Total		1,018

GOVERNMENT INSPECTOR.

DR. T. F. CHAMBERLAIN.

OFFICERS OF THE INSTITUTION.

R. MATHISON	*Superintendent.*
ALEX. MATHESON	*Bursar.*
J. E. EAKINS	*Physician.*
MISS ISABEL WALKER	*Matron.*

TEACHERS.

D. R. COLEMAN, M.A. .... *Head Teacher.*

P. DENYS.	MISS S. TEMPLETON.
JAMES C. BALIS, B.A.	MISS M. M. OSTROM.
D. J. MCKILLOP.	MISS MARY BULL.
W. J. CAMPBELL.	MISS FLORENCE MAYBEE.
GEO F. STEWART.	MISS SYLVIA L. BALIS.
MRS. J. G. TERRILL.	MISS ADA JAMES, *Monitor.*

MISS MARGERY CURLETTE .... *Teacher of Articulation.*

MISS MARY BULL	*Teacher of Fancy Work.*
MISS EDITH M. YARWOOD	*Teacher of Drawing.*

MISS L. N. METCALFE	*Clerk and Typewriter.*
JOHN T. BURNS	*Instructor of Printing.*
I. G. SMITH	*Storekeeper and Associate Supervisor.*
FRANK FLYNN	*Master Carpenter.*
WM. DOUGLAS	*Supervisor of Boys.*
WILLIAM NURSE	*Master Shoemaker.*
MISS A GALLAGHER	*Instructress of Sewing.*
D. CUNNINGHAM	*Master Baker.*
J. MIDDLEMASS	*Engineer.*
THOMAS WILLS	*Gardener.*
MICHAEL O'MEARA	*Farmer.*

List of Pupils in the Ontario Institution for the Education of the Deaf and Dumb for the year ending September, 1894, with the post office addresses.

Counties.	P. O. Address.
Brant—	
Douglas, John A	Onondaga.
Randall, Robert H	Paris.
Bruce—	
Burr, Annetta	Park Head.
Doyle, Francis E	Dobbington.
Gregg, Wm. J. S	Port Elgin.
Luddy, David S	Walkerton.
Rowe, George	Elsinore.
Smith, Louisa	Park Head.
Nicholls, Bertha	Kinlough.
Shilton, John	Walkerton.
Carleton—	
Cyr, Thomas	Hull.
Dubois, Joseph	Ottawa.
Holt, Gertrude M	"
Henault, Charles H	"
Hunter, Wilhemina	"
Jamieson, Eva	"
Lamadelaine, Josephine	"
Lett, Stephen A	Carp.
Lett, Thomas B. H	"
Lett, William P	"
McGillivray, Angus A	Fitzroy Harbor.
McBride, Annie J	Kinburn.
Patrick, John	Carp.
Scott Evan R	Cummings Bridge.
Henault, Honore	Ottawa.
Murphy, Hortense	Ottawa.
Cornwall—	
Kirk, John A	Cornwall.
McDonald, Ronald J	"
McDonald, Hugh A	"
Riviere, Donald J	"
Dufferin—	
Billing, William E	Monticello.
Fleming, Eleanor	Hockley.
Durham—	
Coolidge, Herbert L	Hampton.
Elgin—	
Blashill, Margaret	Aylmer.
Cornish, William	St. Thomas.
Eames, Ina F	"
Henderson, Annie M	Talbotville Royal.
McMillan, Flora E	Dutton.
Wickett, George W	Aylmer.
Smuck, Lloyd	"

Counties.	P. O. Address.
Essex—	
Ball, Fanny L	Windsor.
Ball, Mabel	"
Bain, William	"
Chauvin, Eugenie	Chevalier.
Fairbairn, Georgina	Windsor.
Munroe, George R	Walkerville.
Rebordie, William	Windsor.
Frontenac—	
Watt, David H	Portsmouth.
Grey—	
Andrews, Maud C	Owen Sound.
Brown, Sarah M	Peabody.
Carson, Hugh A	Meaford.
Dewar, Jessie C	Owen Sound.
Dand, William Thomas	Lady Bank.
Moote, Albert E	Owen Sound.
Mitchell, Bertha M	"
Myers, Mary G	Lady Bank.
Haldimand—	
Armstrong, Jarvis E	Jarvis.
Roberts, Herbert W	"
Halton—	
Cunningham, May A	Oakville.
Gillieland, Annie M	"
Smith, Maggie	Acton.
James, Mary T	Kilbride.
Haliburton—	
Orser, Orval E	Wilberforce.
Rooney, Francis P	Kinmount.
Hastings—	
Butler, Annie	Sine.
Beatty, Donella G	Melrose.
Barragar, Martha	St. Ola.
Blackburn, Annie M	Coe Hill.
Chatten, Eliza	Trenton.
Cole, Emily	Maynooth.
Dool, Thomas H	Belleville.
Dool, Charles C	"
Gerow, Daniel	"
Holton, Charles M	"
Hill, Florence	"
Irvine, Eva G	"
Irvine, Ethel M	"
Kavanagh, Matthew	Bancroft.
King, Robert M	New Carlow.
Keiser, Alfred B	Belleville.
McMaster, Robert	"
Robinson, Maggie	"
Swanson, Alex	"

Counties.	P. O. Address.
Hastings—Continued.	
Scrimshaw, James S	Big Springs.
Vance, James H	Bancroft.
Wylie, Edith A	Marmora.
Young, John C	Hazzard's Corners.
Young, George S	"
Barragar, George H	Maynooth.
Huron—	
Burtch, Francis	Gorrie.
Gies, Albert E	Zurich.
Hayward, Mary A	Clinton.
Leigh, Martha	Port Albert.
McKay, Mary L	Moncrieff.
Smalldon, John W	Cranbrook.
Thompson, Mabel	Dungannon.
Thompson, Ethel M	"
Wood, Nelson	Exeter.
Cole, Amos B	Clinton.
Thompson, Beatrice	Dungannon.
Kent—	
Cartier, Melvin	Chatham.
Fisher, John F	"
Henry, George	"
Leggatt, Rachel	Blenheim.
Leguille, Marie	Chatham.
Leguille, Gilbert	"
Mosey, Ellen L	Fargo.
McGregor, Maxwell	Ridgetown.
Simard, Emile	Big Point.
Toulouse, Joseph	Chatham.
Kaufmann, Vesta M	Essex Town.
Lowes, George C	Kent Bridge.
Lincoln—	
Bracken, Sarah M	St. Catharines.
Fretz, Beatrice	Campden.
Lambton—	
Dudley, Eliza	Inwood.
Esson, Margaret	Oil Springs.
Mason, Lucy E	Forest.
Moore, George H	"
McLellan, Norman	Watford.
Scott, Henry P	Forest.
Babcock, Elizabeth	Oil Springs.
Showers, Christina	Shetland.
Showers, Annie	"
Lanark—	
Culligan, Maude	Glen Tay.
Harold, William	Marathon.
McKay, Thomas J	Middleville.
Noonan, Catherine M	Harper.

Counties.	P. O. Address.
Lanark—Continued.	
Noonan, Emily W	Harper.
Noonan, Michael E	"
Noonan, Maggie	"
Noonan, Mary Theresa	"
Leeds and Grenville—	
Annable, Alva H	Prescott.
Barnett, Elmer L	Mallorytown.
Crozier, Fred. W	Harrowsmith.
Crowder, Vasco	Prescott.
Newton, Joseph	Portland.
Newton, Agnes	"
Todd, Richard S	Oxford Mills.
Baker, Fred	Brockville.
Lennox and Addington—	
Bradshaw, Agnes	Harlow.
Hartwick, Olive	Napanee Mills.
Grooms, Herbert	Napanee.
Grooms, Harry E	"
Reid, Walter E	Emerald.
Sager, Mabel M	Napanee.
Sager, Phœbe A	"
Sager, Matilda B	"
Sager, Hattie	"
Hartwick, James H	Napanee Mills.
Sedore, Fredy	Roblin.
Sedore, Ailey	"
Monck—	
Swayze, Ethel	Tilsonburg.
Barnard, Fred	"
Middlesex—	
Allen, Ethel V	Pottersburg.
Currie, Clifford	Glencoe.
Gould, William H	London.
Mitchell, Colin	Alvinston.
Pepper, George	London.
Phillimore, Margaret	Ealing.
Scott, Elizabeth	Moray.
Russell, Mary B	Ailsa Craig.
Muskoka District—	
Hares, Emily L	Allanville.
Morrison, Barbara D	Reay.
Norfolk—	
Chambers, James	Silver Hill.
Harris, Frank E	Simcoe.
Hodgson, Clara M	"
Lewis, Levi	Vanessa.
Pierce, Cora M	Delhi.
Woodward, Edward V	St. Williams.

Counties.	P. O. Address.
Northumberland—	
Bellamy, George	Wicklow.
Cullen, Arthur E	Cobourg.
Warner, Henry A	Castleton.
Cummings, Bert	Norham.
Rutherford, Jessie M	Castleton.
Nipissing District—	
Moore, William H	Mattawa.
Ontario—	
Kirby, Emma E	Oshawa.
Ross, James	Bracebridge.
Goose, Fidelia	Scugog Island.
Oxford—	
Chantler, Thomas	Woodstock.
Chantler, Fanny	"
Elliott, Cora M	Ingersoll.
Elliott, Wilbur	"
Gainer, Mary Malinda	"
McKay, William	Woodstock.
McKenzie, Angus	Tavistock.
McKenzie, Margaret	"
Perry, Algie	Innerkip.
Skillings, Ellen	Kintore.
Yack, Lena	Cassell.
Parry Sound—	
Burk, Walter	Burk's Falls.
West, Francis A	Muskoka Falls.
Veitch, Margaret	Spence.
Veitch, James	Spence.
Perth—	
Clements, Henry	Listowel.
Leslie, Edward	"
Orth, Elizabeth	Shipley.
Orr, James P.	Milverton.
Peel—	
Dixon, Ethel Irene	Elmbank.
Zimmerman, John C.	Palgrave.
Peterborough—	
Crough, John E	Ennismore.
Derocher, Mary E.	Peterborough.
Isbister, John A	Lakefield.
Lawson, Ernest A	Peterborough.
Pilling, Gertrude	"
Prescott and Russell—	
Bourdeau, Benoni	Longtinville.
Charbonneau, Leon	Lefaivre.
Delaney, James	Sarsfield.

Counties.	P. O. Address.
Prescott and Russell—Continued.	
Forgette, Harmudas	South Casselman.
Forgette, Joseph	"
Forgette, Mary Anna	"
Herrington, Isabella	Russell.
Labelle, Noah	St. Albert.
Labelle, Maxime	"
O'Brien, Richard	Billing's Bridge.
Sicard, Moses	The Brook.
Prince Edward—	
Head, Hartley J.	Milford.
McCormick, Mary Pearl	Picton.
Renfrew—	
Brazier, Eunice A.	Combermere.
Corrigan, Rose Ann	Rochefort.
McBride, Hamilton	Westmeath.
Moore, Rose Ann	Osceola.
Tracey, John M.	Pembroke.
Simcoe—	
Armstrong, Mary E.	Collingwood.
Bartley, John Stacey	Barrie.
Corbiere, Eli	"
Hammell, Henrietta	Tottenham.
Lougheed, William J. S.	Orillia.
Watson, Mary L.	"
Wilson, Elizabeth	Beeton.
Woods, Alberta M.	Wyevale.
McKenzie, Herbert S.	Severn Bridge.
Stormont, Dundas and Glengarry—	
Benoit, Rosa	Stormont.
Hence, Henry A.	Glen Walter.
King, Joseph	Lancaster.
Victoria—	
Brown, Eva J.	Valentia.
Elliott, Mabel	Fenelon Falls.
Garden, Elsie	Bobcaygeon.
Justus, Ida M.	"
Justus, Mary	"
Mapes, John M.	Lindsay.
Rutherford, Emma	Fenelon Falls.
Wallace, George R.	Coboconk.
Waterloo—	
Allendorf, Anna M.	Hespeler.
Fenner, Catharine	Waterloo West.
Gardiner, Florence A.	Berlin.
Gardiner, Dalton M.	"
Nahrgang, Allen	New Hamburg.
Ronald, Eleanor F.	Ayr.
Siess, Albert	Berlin.
Schwartzentruber, Catherine	Petersburg.

Counties.	P. O. Address.
Welland—	
Young, Sarah A.	Brookfield.
Wellington—	
Brown, Jessie Mc	Mt. Forest.
Goetz, Sarah	Guelph.
Goetz, Eva	"
Howitt, Felicia	"
Lyons, Isaiah	Mt. Forest.
Morton, Robert M.	Everton.
Watt, William R.	Guelph.
Brown, Wilson	Marsville.
Wentworth—	
Gillam, Christopher	Winona.
Hackbusch, Ernest	Hamilton.
Major, Edith	"
McPhail, Annie	"
McMaster, Catharine	"
Warwick, Emily F.	"
Woodley, Elizabeth	Dundas.
Gillam, Walter	Winona.
Miller, Annie	Hamilton.
York—	
Arnall, George	Toronto.
Burke, Edith	"
Burke, Mabel	"
Edwards, Stephen	"
Grey, William	"
Grey, William E.	"
Hutchinson, Margaret	"
Jaffray, Arthur H.	"
Lightfoot, William	"
Muckle, Grace	"
Muckle, Elizabeth	"
Miller, Jane	"
Munroe, Jessie M.	"
McGregor, Flora	"
McGillivray, Mary	Purpleville.
McCarthy, Eugene	Bracondale.
O'Neil, Mary	Purpleville.
Pinder, Clarence	Davenport.
Shannon, Anna M.	Weston.
Thomas, Blanche M	Toronto.
Terrell, Frederick W.	"
Wilson, M. P.	"
Waters, Marion	"
Ballagh, Winnie	"
Lawson, Frank H.	"
O'Neil, Ignatius D.	"
West, Francis A.	Queensville.
Perry, Frederick R	Eglinton.
Algoma District—	
Smith John	Algoma Mills.

REPORT OF THE PHYSICIAN OF THE INSTITUTION.

T. F. Chamberlain, Esq , M.D.,

Inspector of Prisons and Public Charities, Ontario.

In presenting the report for the year ending September, 1894, I would say the general health has not been up to the standard of former years. It seems almost impossible to collect the children from the various sections of the province, without developing in some way a contagious form of fever in our institution.

Within a few days of our opening, measles appeared ; and, notwithstanding every precaution, became quite epidemic, which entailed no small amount of nursing. Although the epidemic prevailed until the new year, we are fortunately able to report no sequels or deaths. During the decline of measles, we had five cases of scarlet fever, which were not severe and terminated favorably.

In the latter half of the year typhoid fever developed in two boys and six girls of various ages, from what source I am unable to say, as the water was analyzed and found satisfactory. Tessie Noonan died, after an illness of two weeks, her case being complicated with abscess of ear and meningitis. All others convalesced.

Our new hospital, opened formally by Lord Aberdeen on June 1st, and named the *Gibson Hospital*, is a model in every respect, the wards all being well lighted, roomy and thoroughly ventilated. It helped us materially in the treatment of our typhoid cases.

We regret exceedingly to have to chronicle the death of one of our teachers, Mr. Ashley, during the year.

In conclusion, I desire to again express my entire satisfaction with the prompt and willing assistance I have received from superintendent, matron and supervisor, in the discharge of my professional duties.

I have the honor to be, Sir,

Your obedient servant,

Belleville, October 15th, 1894. E. EAKINS, M.D.

MAINTENANCE EXPENDITURE.

Institution for the Deaf and Dumb, Belleville.

Statement of cost per pupil for 1892-3, and 1893-4.

Service.	Total expenditure for year ended 30th September, 1893.	Weekly cost per pupil for 1893.	Yearly cost per pupil for 1893.	Total expenditure for year ended 30th September, 1894.	Weekly cost per pupil for 1894.	Yearly cost per pupil for 1894.
	$ c.	$ c. m.	$ c. m.	$ c.	$ c. m.	$ c. m.
Medicine and medical comforts	182 24	1 3	70 6	270 01	2 0¼	1 05 5
Butcher's meat, fish, poultry, etc	3,766 53	28 0	14 59 9	3,639 78	27 3	14 21 8
Flour, bread, etc	1,634 72	12 2	6 33 6	1,600 54	12 0	6 25 2
Butter	2,823 60	21 0	10 94 4	2,970 80	22 3¼	11 60 5
Groceries	1,884 47	14 0	7 30 4	2,298 20	17 2½	8 97 7⅓
Fruit and vegetables	636 70	4 7	2 46 8	758 09	5 7	2 96 1⅓
Bedding, clothing and shoes	633 75	4 7	2 45 6	689 68	5 2	2 69 8
Fuel	4,695 45	35 0	18 20 0	3,814 45	29 0	14 90 0½
Gas, oil, etc	1,134 44	8 4	4 40 0	1,202 51	9 0⅓	4 69 7⅓
Laundry, soap and cleaning	732 26	5 5	2 83 8	630 39	4 7⅓	2 46 2½
Furniture and furnishings	855 31	6 3	3 31 5	666 92	5 0	2 60 4⅓
Farm and garden, feed and fodder	756 95	5 6	2 93 4	1,155 43	8 7	4 51 3½
Repairs and alterations	1,426 50	10 6	5 52 0	1,021 32	7 6	3 98 9½
Printing, postage, stationery and advertising	776 47	5 8	3 00 9	452 68	3 4	1 76 8⅓
Books and educational appliances	574 96	4 2	2 22 8	606 45	4 5	2 36 8
Miscellaneous, water supply, sewage works, etc.	1,946 10	4 5	7 54 3	2,251 20	16 9	8 79 3½
Salaries and wages	20,979 92	1 56 3	81 31 7	21,101 31	1 58 5	82 42 7
Total	45,440 37	3 38 1	176 11 7	45,129 76	3 39 1⅔	176 29 1

Average number of pupils for 1892-3, 258. Average number of pupils for 1893-4, 256.

TWENTIETH ANNUAL REPORT

OF THE

ONTARIO AGRICULTURAL COLLEGE

AND

EXPERIMENTAL FARM

SIXTEENTH ANNUAL REPORT

OF THE

AGRICULTURAL AND EXPERIMENTAL UNION

1894.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

PRINTED BY ORDER OF THE LEGISLATIVE ASSEMBLY.

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1895.

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TWENTIETH ANNUAL REPORT

OF THE

ONTARIO AGRICULTURAL COLLEGE

AND EXPERIMENTAL FARM,

1894.

GUELPH, January 2nd, 1895.

To the Honorable JOHN DRYDEN,
Minister of Agriculture:

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

In this Report the work of the year 1894 is briefly reviewed under the following heads:

PART I. REPORT OF PRESIDENT.
PART II. REPORT OF PROFESSOR OF GEOLOGY AND NATURAL HISTORY.
PART III. REPORT OF PROFESSOR OF CHEMISTRY.
PART IV. REPORT OF PROFESSOR OF VETERINARY SCIENCE.
PART V. REPORT OF HORTICULTURIST.
PART VI. REPORT OF AGRICULTURIST.
PART VII. REPORT OF FARM SUPERINTENDENT.
PART VIII. REPORT OF EXPERIMENTALIST.
PART IX. REPORT OF PROFESSOR OF DAIRYING.
PART X. REPORT OF MANAGER OF POULTRY DEPARTMENT.
PART XI. REPORT OF PHYSICIAN.
APPENDICES—I. TO V. INCLUSIVE.

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, Affiliated with the University of Toronto, and under the Control of the Minister of Agriculture.

OFFICERS, 1894.

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.,	Agriculturist.
H. L. HUTT, B.S.A.,	Horticulturist.
F. C. HARRISON, B S.A.,	Bacteriologist and Librarian.
L. G. JARVIS,	Manager of Poultry Department.
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.

SECOND YEAR STUDENTS AND MEMBERS OF STAFF, JUNE, 1894.

POULTRY DEPARTMENT.—HOUSE No. 1, INCLUDING OFFICE.

PART I.

REPORT OF THE PRESIDENT.

The year of 1894 has been in every respect a very pleasant and successful year in the history of the Ontario Agricultural College and Experimental Farm. There has been perfect harmony among he officers of the Institution, and the work in every department has been carried on with exceptional vigor. A careful perusal of the different sections of this report will, I think, convince any one that our College is not only furnishing a liberal and thoroughly practical education to the students within its halls, but is doing in sever departments a work of inestimable value for the province at large.

A Step in Advance.

The most noteworthy step in advance which we have taken during the year, has been the establishment of a Poultry Department. We have erected new poultry buildings, with office, pens, yards, hospital, boiler-room, store-rooms, and everything else necessary for the breeding and management of poultry, not on an expensive scale, but according to the most approved methods. We think we have everything that can be desired in the way of equipment, we have purchased first-class stock, and have Mr. L. . Jarvis, one of the best poultrymen in the Dominion, for our manager. A cut giving a front view of House No. 1, Poultry Department, will be found at the beginning of this report. For further particulars about this department, see Part X. of this volume.

Students in Attendance.

The attendance of students during the year has been very satisfactory. In the Fall Term, which closed on the 22nd ult., every room in the College was occupied, and four of our students had to find board and lodging outside. In Appendix I. to this report, it will be seen that the number on the roll in the general course was 180 ; in the dairy course, 103 ; and in the short course for teachers, 7—making a total of 290 in the year 1894.

County Students.

Each county in the province is allowed to send one student free of tuition, and the nomination is made by the county council. Of those on the roll in 1894, forty-one were so nominated, and as a consequence, were exempted from the payment of tuition fees. The counties represented were the following :

Brant, Bruce, Carleton, Dufferin, Dundas, Durham, Essex, Glengarry, Grey, Halton, Huron. Lambton, Lanark, Leeds, Lennox, Lincoln, Middlesex, Muskoka, Ontario. Oxford, Peel, Perth. Peterboro', Prescott, Prince Edward, Russell, Simcoe, Stormont, Victoria, Waterloo, Wellington, Wentworth, and York.

Fees.

Ontario students not nominated by county councils pay a tuition fee of $20 a year, and non-residents (from other provinces, Great Britian, 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.

Analysis of College Roll (See Appendix I.)

1. *General Course.*

(1) From Ontario.

Counties, etc.	*Students.*	*Counties, etc.*	*Students.*
Addington	2	Muskoka	2
Brant	2	Northumberland	1
Bruce	6	Ontario	5
Carleton	2	Oxford	5
Dufferin	1	Parry Sound	3
Dundas	6	Peel	3
Durham	2	Perth	6
Elgin	1	Peterborough	2
Essex	2	Prescott	3
Frontenac	3	Prince Edward	2
Glengarry	6	Russell	5
Grenville	1	Simcoe	9
Grey	4	Stormont	1
Halton	3	Victoria	1
Hastings	1	Waterloo	3
Huron	4	Wellington	4
Lambton	5	Wentworth	3
Lanark	2	York	5
Leeds	2	Toronto	13
Lennox	3		
Lincoln	3		143
Middlesex	6		

(2) From other Provinces of the Dominion.

Provinces, etc.	*Students.*	*Provinces, etc.*	*Students.*
British Columbia	3	Quebec	3
Nova Scotia	2		
North-West Territories	1		12
Prince Edward Island	3		

(3) From other countries.

Countries.	*Students.*	*Countries.*	*Students.*
Bermuda	2	Scotland	4
England	12	United States	2
France	1	Wales	1
India	1		
Ireland	2		25

Total—180.

2. *Dairy Course.*

Counties, etc.	*Students.*	*Counties, etc.*	*Students.*
Addington	1	Ontario	2
Brant	1	Oxford	9
Bruce	2	Peel	1
Dufferin	1	Perth	5
Dundas	5	Peterborough	2
Durham	1	Prince Edward	1
Elgin	4	Renfrew	1
Frontenac	1	Russell	2
Grenville	1	Simcoe	3
Grey	1	Stormont	1
Haldimand	3	Victoria	2
Haliburton	1	Wellington	14
Halton	2	Wentworth	5
Hastings	4	York	3
Huron	4		—
Lanark	3	Cape Colony	1
Leeds	3	New Brunswick	1
Lennox	2	Nova Scotia	1
Middlesex	6	Newfoundland	1
Norfolk	1		

Total—103.

From an examination of this analysis, it will be seen that students in both courses came from all parts of the province. Forty counties were represented in the General Course ; and thirty-four in the Dairy Course. For the General Course, the county of Simcoe sent 9 ; Bruce, 6 ; Dundas, 6 ; Glengarry, 6 ; Middlesex, 6 ; and other counties, a smaller number. In the Dairy Course, the largest number was from Wellington, which had a representation of 14. There were 9 from Oxford, 6 from Middlesex, and 5 each from Dundas, Perth, and Wentworth.

Seventy-nine and four-ninths per cent. of the students in the general course came from the Province of Ontario, and over seventy per cent. of the total number were farmers' sons. Of the 103 in the Dairy Course, all but four were from Ontario.

Religious Denominations.

1. *Students in General Course.*

Presbyterians	60	Roman Catholics	4
Methodists	51	Friends	2
Episcopalians	41	Protestant	1
Baptists	14		
Congregationalists	7	Total	180

2. *Students in Dairy Course.*

Methodists	40	Disciple	1
Presbyterians	40	Protestant	1
Episcopalians	10	Roman Catholic	1
Baptists	8		
Friends	2	Total	103

Age of Students in General Course.

10	16	years of age.	10	24	years of age.
18	17	"	4	25	"
35	18	"	4	26	"
23	19	"	3	27	"
28	20	"	1	28	"
18	21	"	2	29	"
13	22	"	1	30	"
9	23	"	1	32	"

Average age—20 years.

Changes in Staff.

There have been two changes in our staff during the past year.

Dr. W. O. Stewart, of Guelph, was appointed college physician in the month of August, to fill the vacancy caused by the death of the late Dr. McGuire. Dr. Stewart is a young man, well and favorably known in the county of Wellington. He stands well with the profession in Guelph and is doing the college work quite satisfactorily.

The only other change in 1894 was the appointment of L. G. Jarvis, of London, October 1st, as manager of our new Poultry Department. Mr. Jarvis has had ample experience in the breeding and feeding of fowl, and he is everywhere acknowledged to be one of the two best poultry judges in the Dominion of Canada He comes to us strongly recommended, not only by the Ontario Poultry Association, but by the principal poultrymen in all parts of Ontario; and I have no doubt that his work at the college will be a source of strength to the institution and a benefit to the province at large.

Library.

A considerable portion of the sum voted annually under this heading, is spent in purchasing papers and journals of various kinds for the use of students in the reading room. We take the principal Toronto and the Guelph dailies, and papers on general agriculture, live stock, dairying, horticulture, apiculture, poultry, entomology, and those branches of science which have a somewhat direct bearing on the work done in the college class-rooms. The remainder of the money is spent in purchasing books for our library, which now contains over 6,000 volumes that treat more or less directly of the different subjects embraced in our course of study and apprenticeship.

During the past year, F. C. Harrison, B.S.A., under the direction of Professor Panton, has had charge of the library and has continued his work of classification and indexing. As this work progresses, the library becomes more and more useful to both students and instructors.

Geology and Natural History.

Our equipment for the study of geology is ample, and our collection of rock specimens, fossils, and minerals has been so nicely and systematically arranged by Professor Panton that the study of the subject has become simple and interesting to an unusual degree. We have sixteen cases representing the geological formations from the lowest to the highest—from the Laurentian to the modern surface deposits—arranged side by side along one wall of the college museum, and in each case are found typical samples of the rock and fossils of the formation which the case represents. The samples in each case are labelled, and a note is pasted to the lid giving information as to the non-occurrence of the formation or the place of its occurrence in Canada. Besides these cases, arranged to show the formations as they occur, we have forty-two other cases of valuable minerals, which the students are required to examine and classify, indicating the formation or formations in which each specimen is found, and paying special attention to the economic minerals in the collection.

The number of weeds and insects sent to the college for identification is increasing rom year to year. A considerable part of Professor Panton's time is spent in reporting on animal and vegetable pests, and in furnishing written information as to the remedy or remedies which should be applied in each case.

Mr. Harrison, under the direction of Professor Panton, sprayed the greater part of our orchard last spring for the prevention of the apple scab and the destruction of the various insects which attack both apples and plums, and the results proved quite satisfactory ; but a number of the trees were cut down to make way for the new poultry buildings, and the work of the year was thus interfered with. We intend to repeat the experiment next spring

All our students attend lectures in the forenoon, and in the afternoons the first and second year men devote their time alternately to study and manual labor. Such has been our method, but we have recently made a change whereby the second year students spend their afternoons alternately at labor in the outside departments and practical work in the botanical laboratory, instead of study in charge of a master. In consequence of this change, our second year men are enabled to devote some time to the analysis of flowers, the first steps in microscopy, and the study of rust, smut, etc.; and by the practice in laboratory methods thus gained, they are prepared for more advanced and thorough work when they become third year students.

For full information regarding the work of this department, see Professor Panton's report in Part II. of this volume.

Chemical Work for the Dairy.

Much of the work done in the chemical laboratory during the past year has been of an eminently practical character. In addition to his lecturing and a considerable amount of other work, Professor Shuttleworth, with the help of his assistant, Robt. Harcourt, B.S.A., has carried on an elaborate series of experiments in the analysis of milk and cheese for the dairy department :

(1) To determine the ratio of casein to fat in poor, medium, and rich milk.

(2) To determine whether the fat in milk is the exact measure of its cheese-producing power ; in other words, to determine whether the amount of cheese made from poor, medium, and rich milk is always in exact proportion to the amount of fat contained in the milk.

(3) To find a just and satisfactory rule or method for paying the patrons of cheese factories for their milk.

Prof. Shuttleworth's investigations along these lines are of great value. They will be of much interest to all classes of dairymen, and I commend his report, in Part III. of this volume, to farmers and cheese-makers throughout Ontario.

Tuberculosis, etc.

In Part IV. of this volume, Dr. J. Hugo Reed, our veterinary surgeon, has reported our losses of live stock from diseases and other causes in 1894. Our most serious losses were caused by tuberculosis in our dairy herd. Dr. Reed's report contains a full account of the tests which he made and of the results in each case. From his statement of the facts and my own observation of a number of the *post mortem* examinations, I am of opinion :

(1) That the tuberculin test is reliable but very rigid, frequently giving as high a reaction where the traces of the disease are almost, if not entirely, microscopic as where they are clearly manifest and widely diffused.

(2) That the indiscriminate application of the test would result in the slaughter of animals which might perform their legitimate functions and die or be sent to the block without injury or risk to the health of either man or beast.

It is, however, proper that I should report one fact which was to me more alarming than anything else in connection with our tests, viz., that J.J. Mackenzie, B.A., bacteriologist, Toronto, found the *bacillus tuberculosis* in milk from one of our condemned cows —a cow which showed no signs of disease while she was alive. In fact this cow, a young Holstein, appeared to be perfectly healthy, and when she was slaughtered her udder was found to be free from disease, but tubercles were well and clearly developed in her lungs and liver.

In view of all the facts, I think the time has come when some legislative action should be taken to protect the community against meat and milk which contain the germs of this fatal disease.

Bacteriology in Relation to Milk.

The importance of studying the bacteriology of milk is becoming more clearly manifest every day ; and as a first step in the direction of protecting the people of Ontario against the danger from bovine tuberculosis, the Hon. John Dryden, Minister of Agriculture for the province, has instructed me to arrange at once to give the students in our dairy school a course of lectures on bacteriology in relation to milk and practical instruction in Pasteurization, that is, in destroying by heat all the disease germs that may be in the milk. The difficulty is to destroy the germs without injuring the flavor of the milk, and to do so with cheap apparatus and but little trouble.

It would certainly be a great boon for a person to be furnished with an inexpensive and convenient means of removing all doubt about the healthfulness of the milk and cream which his children use from day to day. It is our intention to provide at once for our dairy school the best appliances that can be obtained for this purpose, and to that end we have sent one of our graduates, who has made a special study of bacteriology, to Chicago University, Illinois University, Yale, Harvard, the Wesleyan University (Middletown, Conn.), and one or two other institutions and places, to learn the latest methods of investigation in lacteal bacteriology and obtain the cheapest and best apparatus for the Pasteurization of milk. On his return, he will give a short course of lectures and detailed practical instruction to the students in our dairy school.

Horticultural Department.

This department has been moving forward during the past year. H. L. Hutt, B.S.A., our horticulturist, has given the students of the second year a full and thoroughly practical course of lectures on horticulture, and both first and second year men a considerable amount of practical instruction in grafting, pruning, hybridization, the potting of plants, etc. Wm. Squirrel, the head gardener of the department, under Mr. Hutt, rendered excellent service throughout the year in looking after the large amount of work which was done on the walks and in the garden, orchards, lawn, arboretum, and forest tree clumps. Our florist and assistant gardener, Arthur James, also did good work in the management of the college greenhouses (six in number), so as to show students and others the best methods of growing hot-house vegetables and taking care of plants in such a way as to keep them clean and healthy and have a regular succession of bloom throughout the year.

An important part of Mr. Hutt's work has been in connection with the new fruit experiment stations which were established by the Department of Agriculture in different parts of the province last year. In conjunction with L. Woolverton, M.A., Secretary of the Ontario Fruit Growers' Association, Mr. Hutt has visited the stations already established and has spent some time in examining localities that have been mentioned as places suitable for new stations. This work will be continued from year to year, and we hope soon to have some valuable information to publish under this head.

For a full account of the year's work in this department, see Mr. Hutt's report in Part V. of this volume.

Farm and Live Stock.

G. E. Day, B.S.A., our agriculturist, has given entire satisfaction in his lectures on agriculture and live stock to the students of all the years. He has also given special instruction in arithmetic, English grammar, composition, and spelling, two hours every alternate afternoon, to some students whose early education has been neglected. He has kept the pedigrees of our cattle, sheep, and swine; has issued certificates for all stock sold, and has attended to a somewhat voluminous correspondence connected with his department. Mr. Day has been anxious for some time to commence a series of experiments on the feeding of cattle, sheep, and hogs; but hitherto we have not been able to arrange our stables, sheds, and pens in such a way as to do the work satisfactorily. We hope, however, to have things in shape to commence work on this line at an early date.

Mr. Wm. Rennie, our Farm Superintendent, has devoted his undivided and unremitting attention throughout the year to the men and students at work on the farm and amongst the live stock. Mr. Rennie has been at his post late and early, hot and cold, wet and dry. It would be impossible for any man to give closer personal attention to his own farm than Mr. Rennie has given to the work of the College farm during the past year; and the results are that our men and students have done more and better work than at any time in the past fifteen years, the farm is cleaner and in much better condition than ever before, and our stock has been brought through the year in good condition with a mere trifle for the purchase of grain, bran, etc., compared with the expenditure under this head in the years gone by.

Amongst the items referred to in Mr. Rennie's report, Part VII. of this volume, are fencing and draining. With very little extra outlay for labor, beyond that of the students and our ordinary farm help, a large amount of much needed fencing and underdraining was done during the year—work that has greatly improved the appearance of the farm and has added not a little to its value. I might also speak of grading and gravelling done on the road northwest of the college farm; but a reference to Mr. Rennie's report will better serve the purpose.

Experimental Plots, Etc.

The development of experimental work on the college farm during the last few years may be understood from the following statement as to the number of plots used from year to year:

In 1886	56	plots were used in experimental work.
" 1889	464	" " "
" 1890	625	" " "
" 1891	1,045	" " "
" 1892	1,523	" " "
" 1893	1,612	" " "
" 1894	1,705	" " "

In the last four years, this department has distributed over 23,000 packages of choice grain throughout the province.

Our experimental grounds have been somewhat enlarged during the past year, and the work in the department has been carried on with greater vigor and success than usual; 337 varieties of grain have been tested, 226 of roots, 178 of potatoes, and 110 of fodder corn; and over 700 plots have been devoted to experiments in the selection of seed, dates of seeding, application of fertilizers, growing mixtures of grain, and harvesting of crops at different stages of maturity; also in different methods of cultivating fodder corn, roots, and potatoes, and in preparing potatoes for planting, etc.

During the year, 131 varieties of grain which had been grown on our plots for five years in succession were dropped out of the tests, and a few promising new varieties were imported. Some of those dropped, were fairly good varieties; but they were not amongst the best. Hence their removal from the list.

Much attention in this department has been given of late to the selection of seed, with a view to improve the quality of the best varieties which we now have.

I commend the report of Mr. Zavitz, our experimentalist, in Part VIII. of this volume as one of the most valuable reports ever issued by our experimental department.

Co-operative Experiments.

In addition to his work on the college farm, our experimentalist carries on a large number of co-operative experiments throughout the province, for the purpose of testing our best varieties of grain, roots, potatoes, Indian corn, etc., under various conditions of soil and climate, and to ascertain the results produced by certain fertilizers in different localities: 1,340 such co-operative experiments were made in 1894, and 7,721 plots were used for the purpose. The following tabulated statement indicates in a general way the character of the work done under this head:

Numbers of experiments.	Names of experiments.	Number of plots required for each.	Class of experiments.	Number of plots used for these tests by farmers over Ontario.			
				1891.	1892.	1893.	1894.
1	Testing nitrate of soda, superphosphate, muriate of potash, mixture, and no manure, with oats.	5	Fertilizers.	70	165	322	318
2	Testing nitrate of soda, superphosphate and nitrate of soda mixed, and no fertilizer, with rape	3					
3	Ascertaining the relative value of four varieties of millet	4	Fodder crops.	196	470	894	897
4	Growing lucerne as a crop for fodder	1					
5	Testing six promising varieties of corn	6					
6	Testing five promising varieties of turnips	5	Root crops.	350	705	1,230	1,310
7	Testing five promising varieties of mangels	5					
8	Testing five promising varieties of carrots	5					
9	Testing five promising varieties of spring wheat.	5	Grain crops.	2,026	4,348	4,735	4,794
10	Testing five promising varieties of barley	5					
11	Testing six promising varieties of oats	6					
12	Testing four promising varieties of peas	4					
14	Testing five promising varieties of fall wheat	5					
13	Testing six promising varieties of potatoes	6	Potato crops.	......	.....	.....	402
				2,642	5,688	7,181	7,721

For the results of this work in 1894, see the report of the Experimental Union in Appendix VII. of this volume.

Experimental Dairy.

The work in this department deserves special notice. Mr. T. C. Rogers, our dairyman, under Prof. Dean, made a number of useful experiments during the year in milk-testing, the setting of milk, the effects of different kinds of food on the percentage of fat, etc., all bearing directly on questions which arise with practical dairymen from time to time; and specially important work was done in the cheese department by Prof. Dean and Mr. A. T. Bell, of Tavistock. Very valuable experiments were made systematically throughout the cheese-making season, to determine whether the cheese made from poor, medium, and rich milk varies exactly in quantity and in quality according to the percentage of fat in the milk—in other words, to determine whether the amount of fat in milk is the exact measure of its cheese-producing power. For a full statement of the results of these experiments, see Prof. Dean's report in Part IX. of this volume.

Dairy School.

The second session of our Dairy School opened on the 15th January last and continued till the 15th March for special dairy students, and half a month longer for students in the regular college course. There were 103 special dairy students in attendance, and the work of instruction in milk-testing, butter-making, cheese-making, and the running of cream separators, was in every way satisfactory. A fair proportion of those in attendance succeeded in passing the prescribed examinations on the subjects in the course, and received non-professional certificates. After a year's successful and approved management of a factory, these non-professionals will receive professional certificates.

Dairy Circular.

The following circular was issued early in November for the session to commence on the 14th January, 1895 :

The Dairy School in connection with the Ontario Agricultural College, Guelph, will re-open January 14th, 1895, and remain in session to the 15th March—for a period of two months. Our buildings and equipment are now complete, and we are at length in a position to offer students a very broad and thorough course of theoretical and practical instruction in dairying. In addition to the ordinary appliances, we have in our stables, close to the school, a herd of thirty cows of different breeds for observation and instruction in the methods of feeding and caring for dairy stock ; and a cream separator run by tread power in a room attached to the dairy barn.

The course of practical instruction consists of two branches of the dairy business, viz., factory dairying and home dairying.

Factory Course.

In this department, under competent instructors, students will make cheese and butter on a large scale, learn how to run cream separators, and be given full and repeated instruction in the use of the Babcock tester and the lactometer, together with directions as to the simplest and fairest way of paying patrons for their milk in factories where the Babcock tester is used.

There are five large cream separators in this department—the Danish Weston, the Alexandra, the Alpha de Laval, the United States, and the Sharples' Imperial Russian. Full and repeated instruction with practice in the running and general management of these machines will be given daily throughout the session. In the milk-testing room, there are seven or eight of the best makes of the Babcock tester, of different capacities, some run by hand and others by steam, all for the use of the students in attendance from year to year ; and in the butter-room, there is constant practice throughout the session in churning, and in the working, printing, and packing of butter according to the most approved methods.

Discussions on practical dairy topics, especially the difficulties which arise in making cheese and butter, are carried on in the cheese-room for an hour every afternoon. These discussions have been of much value to students, and they will be continued in the future as in the past. From time to time during the session, this hour is devoted to the judging of cheese and butter by experts brought to the school for that purpose. The scoring of these judges is compared with that of the students and reasons given for the conclusions reached in each case. In this way students get a clear conception of the difference between poor, medium, and first-class goods.

Cheese and butter factories should encourage their makers to devote a couple of months in the winter to this course. It is not intended to take the place of practical experience in a factory, but to supplement it. It is of much practical value to those who take it and will undoubtedly result in material advantage to the factories in which they are employed.

Home Dairy Course.

This course is intended especially for farmers' sons and daughters who wish to learn something about running cream separators, using the Babcock tester, and making butter on the farm. The department is furnished with hand separators, butter-workers, printers, etc ; and full instruction is given by our own butter-maker, Mr. T. C. Rogers, in every detail regarding home dairy appliances, the handling of milk and cream, and the making of butter. Special instruction in cheese-making is also given when required.

Home dairy students are admitted to all lectures and discussions, including practical drill by the Professor of Dairying, on the points and peculiarites of dairy cows, in a live stock class-room provided for the purpose.

We can accommodate 16 to 20 in this course, and we hope to see the full number in attendance throughout the session. Applicants may enter on or after the 15th January and remain as long as they wish—two weeks, the entire session of two months, or longer. Those who decide to take the course, should write at once, stating when they desire to enter and how long they can remain.

Instructors.

1. *Cheese-making.* A. T. Bell, Tavistock, Ont. Assistant, R. W. Stratton, Straffordville, Ont.

2. *Milk-testing.* T. B. Millar, London, Ont., Instructor and Inspector for Western Dairymen's Association.

3. *Cream Separators.* Mark Sprague, Ameliasburg, Ont., Instructor for Creameries Association.

4. *Butter-making.* J. B. Muir, Avonbank, Ont., Assistant in Butter Department, F. J. Sleightholm, B.S.A., Instructor with Travelling Dairy for 1894.

5. *Home Dairy.* T. C. Rogers.

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 bookkeeping, explaining fully the decimal system.

Lectures will commence at 8.30 a.m. and continue for one hour, after which practical work will commence.

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 obtain this certificate students must attend at least *seven weeks* during the course and take regular work in all the branches of the factory course.

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 of 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, 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. These special suits must be kept clean throughout the session.

Home Dairy Course. A charge of $2 for incidental expenses, and a deposit of $1 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.

Prohibitions

Card-playing, smoking, tobacco-chewing, spitting, and noisy or boisterous conduct in any of the dairy buildings are strictly prohibited.

Ladies Invited.

We have made special provision for ladies who wish to take either the factory or the home dairy course. Separate apartments have been fitted up and furnished for their comfort and convenience. Six ladies were in attendance last session ; and we hope to have a larger number in 1895.

Applications for admission shonld 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.

Travelling Dairy.

Our Travelling Dairy was at work from the 1st May to the 17th December. It was in charge of F. J. Sleightholm, B.S.A., and J. Hume, the former of whom had charge as instructor and the latter as butter-maker. The territory covered during the season embraces the counties of Halton, York, North Wentworth, Brant, Kent, Essex, Elgin, and Norfolk. As a rule, the meetings were well attended and close attention was given both to Mr. Sleightholm's lectures and to the practical work done by Mr. Hume. The unanimous verdict is that the Travelling Dairy is doing a work of much value to the farmers of Ontario. Wherever it has gone, great interest in dairying has been created and the quality of home-made butter has been very much improved. In several instances, cheese factories have been started in consequence of the work done and interest created by the Travelling Dairy.

Class Room Work.

Our class-room work went on as usual during the past year. Seven candidates wrote for the degree of B.S A., in the University of Toronto, and passed creditably in all the subjects. A fair proportion of the first and second year students gained a respectable standing in our College Examinations, but the number of failures is so large that it deserves more than a passing notice. (See class-lists in Appendix IV. to this report.)

Arithmetic, English Grammar, and Composition.

The greatest trouble which we have with our students arises from their lack of preparation in the fundamental branches of a Public School education. Even those who bring certificates of having passed the entrance examination for admission to the High Schools, are often found grossly ignorant of Arithmetic, English Grammar, and Composition. They have been taught grammar to no purpose. They do not understand the first principles of the subject, and they cannot spell the ordinary words which they have been using since they began to speak. This fundamental deficiency tells against them in every subject, and the result is a discouragingly large number of failures at the end of each term, varying from 30 to 55 per cent. of the total number of candidates.

No doubt a more rigid matriculation examination would remove the difficulty, but experience has taught us that the application of this remedy would exclude from the College a large proportion of our best students; so, at present, the only suitable and effective remedy which we can think of is a Preparatory Department for the instruction of those who have not had the training necessary to fit them for the regular College work.

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:

Prof. W. J. Alexander, University College	2nd year Literature.
J. M. McEvoy, B.A. LL. B., London, Ont	Political Economy.
J. J. Ferguson, B.S.A., Smith's Falls	1st year Chemistry.
F. C. Harrison, B.S.A., Guelph	1st year Hygiene.
" " "	1st year Literature.
" " "	1st year Botany.
" " "	2nd year Literature.
R. Harcourt, B. S. A., Guelph	2nd year Chemistry.

Bachelors of the Science of Agriculture.

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

Brown, W. J	Dunboyne, Elgin County, Ont.
Ferguson, J. J.	Smith's Falls, Leeds, Ont.
Graham, W. R.	Belleville, Hastings, Ont.
Kennedy, P. B.	Sarnia, Lambton, Ont.
McCallum, W	Guelph, Wellington, Ont.
Sleightholm, F. J.	Humber, Peel, Ont.
Spencer, J. B.	Brooklin, Ontario County, Ont.

Recipients of Associate Diplomas.

Twenty-five having completed our regular course of two years, were examined for associate diplomas. Of these, twenty-one passed in all the subjects, and four were starred as indicated in the list. The diplomas were presented by the Hon. James Young, of Galt, at our closing exercises on the 30th June ; and the names of the recipients are as follows, excepting the four that have stars opposite their names :

Buchanan, John	Hensall, Huron, Ont.
Carrick, C. S	Kincardine, Bruce, Ont.
Christian, A. H	Danforth, York, Ont.
Cook, J. H	Gordonville, Wellington, Ont.
Doherty, M. W.	Eglinton, York, Ont.
Duffett, G. P.	Adolphustown, Lennox, Ont.
Elliott, Wm	Galt, Waterloo, Ont.
Henderson, R. H.	Rockton, Wentworth, Ont.
High, A. M	Beamsville, Lincoln, Ont.
Kennedy, W. A	Apple Hill, Glengarry, Ont.
Kidd, D. F	Cookstown, Simcoe, Ont.
King, A. A	Johnston's Crossing, Colchester, N.S.
Lailey, F. T	Toronto, York, Ont.
Laird, J. G	Sarnia, Lambton, Ont.
Reinke, C. E.	Ancaster, Wentworth, Ont.
Robertson, G. A	Kingston, Frontenac, Ont.
Rowe, G. F	London, England.
*Shorey, S. C	Harrowsmith, Addington, Ont.
Simpson, A. E.	Hamilton, P.E.I.
*Smyth, F. L.	Tormore, York, Ont.
*Traviss, C. H.	Holt, York, Ont.
*Vipond, J. M.	Donegal, Perth, Ont.
Wheatley, John	Blackwell, Lambton, Ont.
Widdifield, J. W	Siloam, Ontario, Ont.
Wilson, E. E.	Brampton, Peel, Ont.

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 1894, arranged alphabetically :

First Year.

1. *Clark, J. F.*, Bay View, P.E.I., in five departments : Agriculture, Natural Science, Veterinary Science, English Literature, and Mathematics.
2. *Carlyle, S. G.*, Chesterville, Dundas Co., Ont., in two departments : Agriculture and Veterinary Science.
3. *Campbell, W. G.*, Brantford, Brant, Ont., in two departments : Agriculture and Mathematics.
4. *Lang, L. W.*, St. Marys, Perth, Ont., in five departments : Agriculture, Natural Science, Veterinary Science, English Literature, and Mathematics.
5. *Lewis, G.*, Ballymote, Middlesex, Ont., in one department, viz., Agriculture.
6. *Paterson, T. F.*, Lucknow, Bruce, Ont., in four departments : Agriculture, Natural Science, Veterinary Science, and Mathematics.
7. *Summerby, W. L.*, Russell, Ont., in four departments : Agriculture, Natural Science, English Literature, and Mathematics.

* To take supplemental examinations: Shorey, in Agricultural Chemistry ; Smyth, English Grammar ; Traviss, English Literature ; Vipond, English Literature.

Second Year.

1. *Buchanan, John*, Hensall, Huron, Ont., in one department, viz., Mathematics.
2. *Kennedy, W. A.*, Apple Hill, Glengarry, Ont., in two departments: Agriculture and Mathematics.
3. *King, A. A.*, Colchester, Nova Scotia, in one subject, viz., Agriculture.
4. *Kidd, D. F.*, Cookstown, Simcoe, Ont., in one department, viz., Veterinary Science.
5. *Robertson, G. A.*, Kingston, Frontenac, Ont., in three departments: Agriculture, Natural Science, and Mathematics.
6. *Wheatley, John*, Blackwell, Lambton, Ont., in four departments: Agriculture, Natural Science, Veterinary Science, and Mathematics.
7. *Widdifield, J. W.*, Siloam, Ontario County, Ont., in one department, viz., Agriculture.

Medallists.

Medals are given to the three students who rank highest in general proficiency in the theory and practice of the second year. The following were the successful competitors in 1894:

Gold Medallist—John Wheatley, Blackwell, Lambton, Ont.

First Silver Medallist—G. A. Robertson, Kingston, Frontenac, Ont.

Second Silver Medallist—W. A. Kennedy, Apple Hill, Glengarry, Ont.

First Year Prize Men.

Agriculture and Dairying—1st, J. F. Clark, Bay View, P.E.I.; 2nd, T. F. Paterson, Lucknow, Bruce, Ont.

Natural Science—1st, J. F. Clark; 2nd, W. L. Summerby, Russell, Russell, Ont.

Veterinary Science—1st L. W. Lang, St. Marys, Perth, Ont., and T. F. Paterson; 2nd, J. F. Clark.

English Literature and Composition—1st, J. F. Clark; 2nd, W. L. Summerby.

Mathematics and Bookkeeping—1st, J. F. Clark; 2nd, T. F. Paterson.

General Proficiency—1st, J. F. Clark; 2nd, T. F. Paterson; 3rd, W. L. Summerby and L. W. Lang.

Special Prize in Bee Keeping, offered by W. F. Clarke—E. Rive, Guelph, Ont.

Second Year Prize Men.

Agriculture, Live Stock, and Dairying—1st, A. A. King; 2nd, John Wheatley.

Natural Science—1st, John Wheatley; 2nd, G. A. Robertson.

Veterinary Science—1st, D. F. Kidd; 2nd, John Wheatley.

English Literature and Political Economy—1st, F. T. Lailey; 2nd, John Wheatley.

Mathematics—1st. G. A. Robertson; 2nd, W. A. Kennedy.

General Proficiency—1st, John Wheatley; 2nd, G. A. Robertson; 3rd, W. A. Kennedy; 4th, J. W. Widdifield; 5th, A. A. King.

Special Prize for Essay on Fat Stock Show—1st, A. E. Simpson; 2nd, A. H. Christian.

CLOSING EXERCISES.

Our closing exercises took place on the 29th June. The day was fine, and the attendance of visitors was exceptionally large. Our new hall, which holds about 900 people, was filled and everything passed off very pleasantly. The Hon. James Young, of Galt, presented the diplomas, and a number of gentlemen from Guelph and the surrounding country assisted in the presentation of medals, prizes, and honor certificates.

The George A. Cox Scholarships.

Amongst the distinguished visitors present at the closing exercises, were George A. Cox, Esq., President of the Canadian Bank of Commerce, and Mrs. Cox; and in the course of the proceedings, Mr. Cox gave us a very pleasant surprise by announcing that for some time to come he would give the College $100 a year to be awarded in scholarships as we might determine; and the result was that we were able to make the following announcement to the students who entered in October and are now in attendance:

The George A. Cox Scholarships, $100. George A. Cox, Esq., President of the Canadian Bank of Commerce, has very kindly and generously offered five scholarships of $20 each, to be paid in money to the students who shall rank highest in each of the five departments of instruction in the year, provided—

(1) That the candidate take not less than 40 per cent. of the marks in each subject embraced in the year's work, and attain a first-class rank in the department in which the scholarship is awarded.

(2) That he complete the second year work and take an associate diploma within two years from the date at which the scholarship is awarded—$10 of the money to be paid at the end of the first year, and the remaining $10 at the completion of the second year.

No student shall receive more than one of these scholarships. If two or more scholarships are won by one student, or if any scholarships or portions of scholarships are not awarded or paid on account of non-attendance or other causes, they may be awarded in each case to the student who stands next highest in that or any other department, provided he complies with the conditions laid down in provisos (1) and (2) of the preceding paragraph.

Note.—To be ranked first-class in a department, it is necessary to obtain 75 per cent. of the aggregate number of marks allotted to the subjects in that department.

Valedictory Prize.

A prize of $10 in books is offered annually to the second year students for a valedictory address, and the competition for the honor is usually keen. The subject last year was "The Beautifying of Country Homes," and there were several competitors; but none of them reached the required standard of excellence. Hence no valedictory prize was given in 1894.

Summer School for Teachers.

For the second time, we sent out a circular announcing a short summer course of lectures with practical instruction in agriculture and kindred branches for public school teachers; but there was little or no response, owing to a change in the regulations of the Department of Education whereby agriculture has been removed from the list of public school studies.

Seven teachers came and spent the month of July very pleasantly in studying agriculture, live stock, butter-making, chemistry, geology, botany, and entomology. The lectures and practical instruction given throughout the month were the same as were given to the much larger class of 1893; and the total cost to each teacher for the month's board, lodging, and tuition was $12.

This work must, of course, be discontinued so long as the present regulation is in force.

Visitors.

On the 17th February, the College was favored with a visit from Lord and Lady Aberdeen Their Excellencies, accompanied by Captain Kindersley, Mr. Ferguson, and Private Secretary Campbell, arrived here early in the day and proceeded at once to the dairy school, which they inspected throughout with the most minute attention to every detail of work and instruction. They then visited the dairy stable and farm buildings, to see the live stock, and afterwards went to the President's house for lunch, where they were joined by the Hon. John Dryden and Mrs. Dryden, Vice-Chancellor and Mrs. Mulock, of Toronto; Mayor and Mrs. W. G. Smith, of Guelph; James Innes, M.P., and Mrs. Innes, and Donald Guthrie, Q.C., M.P.P., and Mrs. Guthrie. After lunch His Excellency delivered a short but very happy and appropriate address to the students in one of the class-rooms. The party then visited the chemical and botanical laboratories, the gymnasium, and college dormitories, after which they took a drive through the city of Guelph, and their Excellencies, after spending a short time in the curling rink, proceeded to the City Hall, where they held an informal reception from 4 to 5 p.m. Immediately after the reception, the party partook of a very nice luncheon which had been prepared by order of the mayor and aldermen of the city, and their Excellencies left by the 5.40 train for the east.

This visit from their Excellencies was very much appreciated; and the unanimous verdict was that they are worthy representatives of Her Majesty the Queen—bright, clever, intelligent, and easy to entertain.

We have had a constant stream of visitors at the college throughout the year; and in the month of June, we had the pleasure of entertaining over 10,000 excursionists (chiefly farmers), who came to inspect the farm and our equipment for work in the different departments of the institution.

Farmers' Institutes.

After ten years' service in organizing and directing the Farmer's Institutes of the province, I decided to make way for someone who could devote his whole time to the work. At the last meeting of the Central Farmers' Institute, I ventured to suggest a change; and the result was that the Minister of Agriculture soon after appointed F. W. Hodson, of the *Farmer's Advocate*, London, to take charge as Director or Superintendent ot Institutes.

Mr. Hodson is in many respects well qualified for the position. He has had a thorough training in the practical details of general farming and stock-raising; he is well-versed in journalism; he is a hard worker, and has an unlimited amount of energy and perseverance. I have no doubt the institutes will do an increasingly useful work under his management.

A list of institute meetings, arranged by Mr. Hodson for January, 1895, will be found in Appendix VI. to this report.

Financial Statement.

For a statement of the revenue and expenditure of the different departments, see Appendix V. to this report. It will be observed that the total unexpended balances on the year's operations in all departments is $5,142.48.

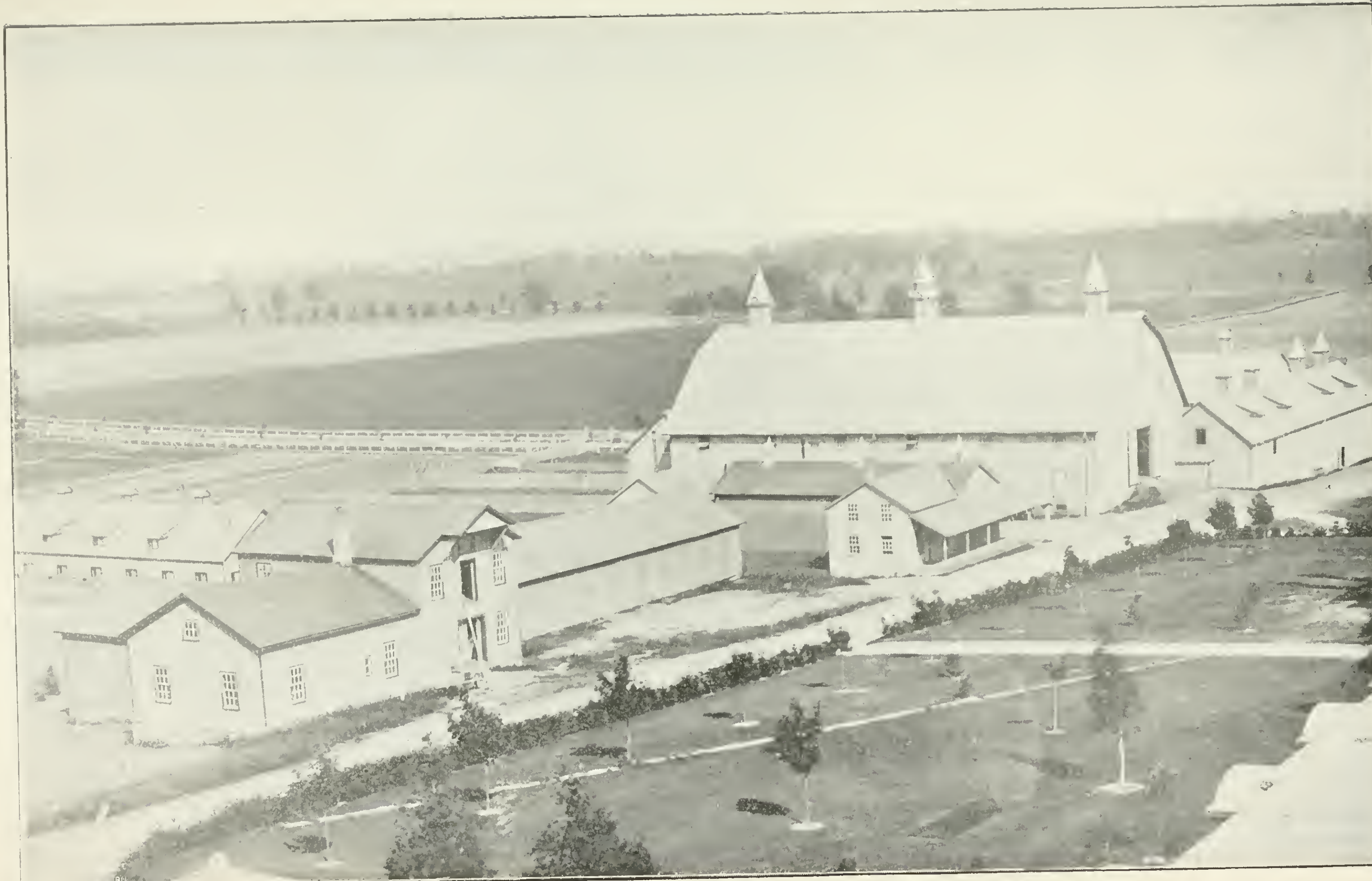
Conclusion.

With the addition of our new poultry buildings, I think I may say that never before were we so well equipped for work in the different departments of the institution as we are at the present time. We have the principal buildings which we require, and our appliances for practical work are nearly all that we need for the students now in attendance.

Our most urgent needs for the immediate future are a large building for the work of the experimental department, and five or six dwelling houses for members of the staff.

JAMES MILLS,
President.

BACK VIEW OF FARM BUILDINGS AND GYMNASIUM, TAKEN FROM EXPERIMENTAL GROUNDS.



CARPENTER SHOP AND FARM BUILDINGS, TAKEN FROM TOP OF COLLEGE

PART II.

REPORT OF THE

PROFESSOR OF NATURAL HISTORY AND GEOLOGY.

To the President of the Ontario Agricultural College :

Sir,—From a perusal of the report which represents the work accomplished in the Department of Natural History during 1894, it will readily be seen that considerable has been done beyond the work of the classroom. It is very gratifying to notice, from year to year, a greater desire among farmers to know more of the scientific principles which underlie the operations in agriculture, and that they recognize the Ontario Agricultural College as an important source from which such knowledge can be obtained.

Many inquiries have been sent to this department during 1894 regarding insects and plants beneficial or injurious to agriculture. In a subsequent part of this report a list of plants and insects received for identification is given.

In order to appeal to the *eyes* and even *hands* of students, as a means of making lasting impressions upon their minds, we have added still further to our excellent collection of charts, lantern slides, and specimens, and as far as time permitted introduced practical work into the classroom. The practical analysis of plants and examination of insects, together with the use of the microscope, are being emphasized in the second year more than formerly. In the first year, students in botany make an analysis of a plant in each lecture and identify it from the data observed during the examination of the plant. In the third year, we have added another half day to practical work in microscopy, so that three lessons are now given weekly instead of two. This arrangement enables students in microscopy to give more attention to the preparation of specimens and a practical study of the subject.

In the advance which has been so characteristic in the study of life, as it is expressed in the animal and plant, we have been striving to keep in line, and from year to year have added to our work by more thorough and practical teaching, where time and equipment have permitted. During 1894 further progress has been made by the purchase of additional apparatus, the preparation of a room for photography, and the study of cryptogamic botany, as it relates to the crops of the garden, orchard and field.

The appointment of an assistant has enabled us to accomplish much which could not have been done otherwise. As demonstrator in microscopy, he is able to give time to the preparation and examination of specimens for practical work, while a portion of his time is also necessarily required in the library as acting librarian, indexing reports, etc., and in the museum labelling and arranging specimens.

1. Museum.

Here a decided improvement has been made in our collection of birds. Through the kindness of the Minister of Agriculture, we had donated to the museum 200 birds from the collection exhibited at Chicago to illustrate the birds of Ontario. Before adding this valuable lot to our own we repainted the cases, selected the best typical birds from our own, and classified the whole according to the classifiication now followed by the American Orinthological Union. The collection now presents an excellent appearance, and is arranged so as to be of great assistance to the students who desire to study economic orinthology.

We have also added 150 unmounted birds to our list for use in the class-room. These embrace most of the insectivorous birds found in Ontario, and will be of great value in connection with the study of economic entomology. They are numbered and labelled in such a way as to be readily examined by the students who may wish to handle and compare them thoroughly.

P. P. Smith, a student of the second year, from Bermuda, has kindly donated some interesting specimens, such as a cow-fish, a flying-fish, and fragments of coral.

J. F. Clarke, also a student of the second year, has added some specimens of Triassic rock from Prince Edward Island, to our geological collection.

F. C. Harrison, B. S. A., presented 80 specimens of mounted plants collected around Ithaca, N. Y., during the summer of 1894.

2. Library.

The books of the library have been re-arranged, and a large amount of indexing accomplished duing this year. These changes have been of great convenience to both officers and students.

The number of volumes now in the library is over six thousand. 164 volumes have been added this year; these may be grouped as follows: Reports, 29; Herd Books, 5; Botany, 8; Geology, 2; Agriculture, 11; Chemistry, 4; Literature, 5; History, 2; Biography, 10; Poultry, 1; Mathematics, 6; Dairying, 34; Horticulture, 32; Entomology, 2; General Science, 2; Parliamentary Reports, 10; Political Economy, 10.

3. Reading Room,

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

(a) *Sent free by the Publishers.*

Journal of Commerce, Montreal; Canadian Baptist, Toronto; Christian Guardian, Toronto; Canada Presbyterian, Toronto; Monthly Weather Review, Toronto; Presbyterian Review, Toronto; Sheep Breeder and Wool Grower, Chicago; Manitoba Weekly Free Press, Winnipeg; Canadian Horticulturist, Grimsby; Canadian Entomologist, London, Ont.; Bee Journal, Beeton; North York Reformer, Newmarket; Acton Free Press, Acton; Ontario Evangelist, Erin, Ont.; Evangelical Churchman, Toronto, Farmers' Review, Chicago; Canadian Independent, Toronto; Rural Home Journal, Kentucky; Canadian Churchman, Toronto; Canadian Independent, Toronto; Canadian Evangelist, Toronto; Canadian Bee Journal, Brantford; Poultry Journal, Beeton; Farmers' Home, Ohio; Farmers' Review, Chicago.

(b) *Furnished by the College.*

Daily Globe, Toronto; Daily Mail, Toronto; Daily Empire, Toronto; Daily Mercury, Guelph; Daily Herald, Guelph; Rural Canadian, Toronto; Grip, Toronto; Poultry Review, Toronto; Farmers' Advocate, London, Ont.; Canadian Stock Raisers' Journal, Toronto; Nor'West Farmer, Winnipeg; Breeders' Gazette, Chicago North British Agriculturist, Edinburgh, Scotland; American Garden, Greenfield, Mass.; Cultivator and Country Gentleman, Albany, N.Y.; Scientific American, New York; Live Stock Journal, England; American Dairyman, New York; Literary Digest, Boston; Canadian Agricultural and Home Journal, Peterborough; Hoard's Dairyman, Ft. Atkinson, Wis.; Maritime Agriculturist, Sackville, N.B.; Science, New York; Garden and Forest, New York; Scientific American Supplement, New York.

4. Practical Work.

Experiments have been carried on in spraying which show conclusively that where it is done thoroughly at the proper time the work will be successful in preventing losses from insects and parasitic plants.

The use of Bordeaux mixture not only prevents the growth of injurious fungi, but has a most marked effect upon the health of the leaves, sprayed trees retaining their foliage a much longer time than unsprayed ones, and the leaves presenting a most healthy appearance In the use of fungicides, we made our first application before the buds began to swell, the solution being 1 lb. of copper sulphate in 25 gals. water; the second, before bloom and after the foliage had appeared. In this case we used Bordeaux mixture, made of 5 lb. sulphate of copper and 4 lb. fresh lime in 40 gals. water. The third application was made immediately after bloom, and the fourth from 12 to 15 days after. I am inclined to think that the mixture may be successful with a pound less of copper sulphate, which forms a very simple formula to remember, namely: 1 lb. copper sulphate, 1 lb. lime, and 10 gals. water. This, of course, is the same as 4 lb. copper sulphate, 4 lb. lime, and 40 gals. of water; but expressed as above is readily remembered, and may be made in any quantity desired by simply increasing the number of pounds and gallons of material used.

In preparing Bordeaux mixtures care requires to be exercised. The copper compound can be dissolved readily in warm water, but takes much longer time in cold. If a bag containing the compound be suspended in the water at the top of the vessel, the whole will dissolve readily. As one gallon of water will dissolve a pound of the sulphate, a few gallons of water may be used at first and the remainder added afterwards. The lime should be *fresh* and should be slaked, and then enough water added to make a creamy whitewash; this may then be poured into the copper sulphate solution. It is an improvement to strain it while adding it to the copper compound, especially if there are any particles of dirt, etc., present, which might have a tendency to clog the nozzle of the sprayer. The balance of the water having been added the whole is thoroughly stirred and ready to use. To avoid delay the sulphate of copper may be dissolved some time beforehand and a solution always ready which would represent, say 1 lb. copper sulphate for each gallon of water, then all that is necessary is to take as many gallons of this as the formula requires pounds of copper sulphate, and add milk of lime as above described.

Some have experienced failure from the fact that the lime has not prevented the corrosive effect of the copper compound, but if the lime is good and fresh a mistake is not likely to occur if the above proportions are followed.

However, there is a simple test which may be applied. Get an ounce of ferro-cyanide of potassium and dissolve it in a pint of water, add a drop or two of this at a time when you are pouring in the milk of lime. As long as there is not plenty of lime added a dark brown color will appear as each drop falls on the mixture; but as soon as the ferro-cyanide solution fails to give a color enough milk of lime has been added. In making Bordeaux mixture it will be remembered that it should be done in earthen or wooden vessels. Powdered copper sulphate will dissolve more readily than uncrushed. Bordeaux mixture gave excellent results against "apple spot" and "gooseberry mildew."

Spraying kerosene emulsion upon our apple trees affected with bark lice, on the 12th of June, when the young lice were observed to be moving from under the scales, was followed by excellent results. A second application was made about ten days after.

An examination of the young wood in October revealed very few scales, and in most cases none on the twigs, showing that we had kept the young lice from spreading.

Ordinary kerosene emulsion is made of one-half pound hard soap, two gallons kerosene and one gallon water. The emulsion being diluted with nine parts water.

Sour milk may be used in making the emulsion, then all that is necessary is to stir together one gallon sour milk and two gallons kerosene.

Our best results in preventing injuries from the cabbage fly (*anthomyca brassicae*) were obtained from the use of tar paper upon the plant. Pieces of tar paper, three inches square, were used. These were cut half way across and the plant put in the slit about the centre of the square and then planted. This method (first used at the Wisconsin experiment station) has been followed in several places and has been very effective. As the paper fits closely to the plant and has a strong smell, it keeps the fly from laying its eggs upon the young plants.

The McGill Brothers, of London, Ontario, sent some of their "Tree Protectors" during the summer and desired us to try their success in trapping codling moths. These funnel-shaped protectors are fastened around the trunk of the tree, a few feet from the ground. On the under side and in the upper part a piece of tow is placed for the purpose of affording the larvæ a hiding place. I placed the "protectors" representing the sizes, 1 (largest), 2, 3, 4, upon twenty-five trees, and obtained the following results:

Size.	No. of codling moth larvæ caught on each tree.	Total.
1.	55, 57, 49, 40, 39, 59	299 on 6 trees.
2.	44, 118, 23, 18, 18, 10, 14, 15	260 on 8 trees.
3.	10, 7, 10, 10, 8, 12, 11	68 on 7 trees.
4.	2, 6, 1, 5	14 on 4 trees.
	Total	641 on 25 trees.

Or an average of 25 worms per tree.

I observed upon the old trees that many of the pupæ were well in the bark and not many in the tow; but in the young trees, where the bark was smooth, they were largely in the tow, thus showing how important it is to clean off the rough bark. Sizes 1 and 2 were applied to trees in an old orchard, and sizes 3 and 4 to trees in a young one.

The year 1894 has been very unfavorable for spraying. During the early part of the season rain fell daily, so that it was almost impossible to get a suitable time to spray. High winds often prevailed when the rain ceased and thus the conditions were most unfavorable to effective results. About June 10th warm weather set in and supplied conditions very suitable for the development of fungoid pests, and these continued for most of the summer months. Yet, notwithstanding such adverse conditions, our spraying was followed by good results.

There is no doubt insects and fungi can be controlled by the use of insecticides and fungicides applied in this way. To destroy insects four ounces of Paris green were added to forty gallons Bordeaux mixture and applied as a combined insecticide and fungicide.

In this department 125 different kinds of seeds were identified, and also a large amount of work done to secure the data presented in Bulletin XCVIII. ("Impurities in Clover Seed"), and printed in this report.

Seventy-five insects and 128 plants have been identified, and information regarding their habits, etc., supplied to correspondents.

Many letters were received asking for information upon spraying, etc. As this is a comparatively new thing and very little known about it, the replies in many cases necessitated much care and time. One correspondent sent a letter containing twenty-five questions, and wrote saying he thought it would require a book to answer his questions fully.

The following is a list of the different species of insects and plants that have been identified and reported upon during 1894; but this does not give the number of specimens sent, for in several cases the same species was received from different localities.

The appearance of the "army worm" (*Leucania unipuncta*) near Petrolea, having caused considerable alarm, I have in another part of the report given some notes upon its life history and habits. I have also given some notes upon anthracnose of the raspberry, as it seems to be quite common in several parts of Ontario, judging from the ques-questions sent regarding it.

Insects Received and Identified During 1894.

Scientific name.	Common name.
Soperda calcarata	Poplar borer.
Mytilaspis pomorum	Bark louse.
Agriotes communis	Wire worm.
Anthomyia ceporum	Onion maggot.
Callosamia Promethea	Promethea Emperor moth.
Monohammus scrutator	Pine tree borer.
Pieris rapæ	Cabbage worm.
Agrotis sub-gothica	Striped cut worm.
Hæmotobia serrata	Horn fly.
Phytoriomus punctatus	Clover leaf beetle.
Iulus multistriatus	Millipede.
Tmetocera ocellana	Bud moth.
Siphonophora avenæ	Grain louse.
Tinea biselliella	Clothes moth.
Hypoderma bovis	Ox bot.
Monomorium pharaonis	Common ant.
Diabrotica bi-vittata	Cucumber beetle.
Lumbricus terristris	Earth worm.
Piophila casei	Cheese skipper.
Trichodectes scalaris	Cattle louse.
Graptodera chalybea	Grape beetle.
Saperda candida	Two-striped borer.
Coleophora Fletcheri	Cigar-case insect.
Coccinella	Lady bird.
Ephestia Kuhniella	Flour moth.
Leucania unipuncta	Army worm.
Helochara commensis	Spittle insect.
Calandra granaria	Granary weevil.
Podisus placidus	Placid soldier bug.
Caloptenus femur-rubrum	Grasshopper.
Silvanus surinamensis	Grain beetle.
Hylastes trifolii	Clover root borer.
Diapheromera femorata	Walking-stick insect.
Tremex Columba	Pigeon tremer.
Trichobasis punctatus	
Euphoria India	Indian cetonia.
Hæmatopinus ensysternus	Cattle louse.
Tischeria malifoliella	Apple-leaf miner.
Dryocampa rubicerreda	Spring maple worm.
Hæmatopinus urius	Hog louse.
Desmoceras palliatus	Elder borer.
Clisiocampa Americana	American tent caterpillar.
Catastega aceriella	Maple leaf worm.

Plants Received and Identified During 1894.

Chimaphila umbellata	Prince's pine.
Cichorium Intybus	Chicory.
Artemisia biennis	
Ambrosia artemisiæfolia	Ragweed.
Bromus secalinus	Chess.
Brassica sinapistrum	Wild mustard.
Polygonum Pennsylvanicum	Large smartweed.
Camelina sativa	False flax.
Spergula arvensis	Spurrey.
Zanthoxylum Americanum	Prickly ash.
Antennaria plantaginilolia	Everlasting.
Cerastium viscosum	Mouse ear chickweed
Lithospermum arvense	Redroot pigeonweed.
Trifolium arvense	Rabbit-foot clover.
Silene inflata	Bladder campion.
Aralia quinquefolia	Ginseng.
Hieracium	Hawkweed.
Poa compressa	Wire grass.
Apios tuberosa	Ground nut.
Sagittaria variabilis	Arrowhead.
Souchur arvensis	Perennial sow thistle.
Anthemis arvensis	Chamomile.
Xanthinia spinosum	Spiny clotbur.
Carex lupulina	Sedge.
Poa protensis	June grass.
Festuca elatior	Tall fescue.
Lolium perenne	Perennial rye grass.
Agrostis vulgaris	Red top.
Phalaris intermedia	Canary grass.
Actaea spicata	Baneberry.
Agropyrum tenerum	
Poa trivialis	Rough meadow grass.
Sisymbrium Sophia	Flixweed.
Cheniopodium Botrys	Jerusalem oak.
Echium vulgare	Blueweed.
Vaccaria vulgaris	Soapwort.
Arternisia Absinthium	Wormwood.
Alopecurus aristulatus	Water fox-tail.
Eleocharis palustris	Spiked rush.
Carex vulpinoides	Sedge.
Scirpus absovireus	Bulrush.
S. criophorum	Rush.
Carex irrigua	Sedge.
C. aquatilis	Sedge.
Glyceria fluitaus	Manna grass.
Calamagrostis longifolia	
Glyceria Canadensis	Rattlesnake grass.
G. nervata	Rattlesnake grass.
Poa serotina	False redtop.
Panicum glabrum	Panic grass.
P. crus-galli	Barnyard grass.
P. capillare	Witch grass.
Elymus Canadensis	Wild rye.
Calluna vulgaris	Heather.
Sombucur Canadensis	Common elder.
Euonymus Americanus	Strawberry bush.
Amarantus paniculatus	Prince's feather.
Plantago lanceolata	Rib grass.
Rubus Canadensis	Low blackberry.
Pyrus arbutifolia	Choke-berry.
Cienta maculata	Water hemlock.
Glœosporium venetum	Raspberry anthracnose.
Glœosporium fructigenum	Apple rot.
Roestelia aurantiaca	Quince rust.
Morielia fructigena	Plum rot.
Taphrina pruni	Plum pockets.
T. deformaus	Peach leaf curl.

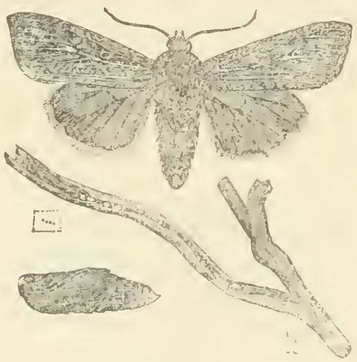
Army Worm (*Leucania unipuncta*). This insect has a preference for grass on low, wet soils, but often feeds upon wheat, oats, corn, timothy, and other grasses.

It is more likely to make its appearance in a rainy season than a dry. This fact may account for its presence during the early summer of 1894. With favorable seasons it may become very numerous and a source of trouble by the worms migrating from field to field in search of food. Although the moth which gives rise to the "army worm" is seen from time to time, yet it is rarely that they reach such numbers as to cause alarm.

During 1894 they have been much more common than in former years. Specimes of the larvæ were sent the writer from Little Britain, near Lindsay, and from Alvinston, near Petrolea. At the latter it appeared in such numbers that a correspondent reported 60 tons of hay and 300 acres of oats destroyed by the millions of "worms" which seemed to devour everything in their way. The specimens sent from this place were badly infested by the larvæ of a Tachnia fly (*Nemorœa leucaniœ*), a great parasitic enemy of the "army worm." It is likely this parasite will largely ward off an attack in '95.

It is generally found that where the "army worm" reaches such numbers as to form so-called armies migrating in search of food, this parasite appears in great numbers and exercises a most beneficial effect in destroying the "worms" and thus preventing an attack the following year.

The larva of the "army worm" is about 1½ inches in length, of a dull grey color, with black stripes and numerous lines of white along the back. The underside of the body is greenish, and the head a pale yellow, with brown lines on the side. When migrating they usually move in one direction and are very active.



THE MOTH.

THE CATERPILLAR.

As soon as fully developed, which takes about three to four weeks, they burrow into the ground and enter the pupa condition; this state lasts for about two weeks, when the moths appear. Some of the specimens were put in boxes; in three days they entered the pupa condition, and in twelve the moths appeared. The moth is fawn-colored, with a small white spot near the centre of the front wings. The width of the wings when spread is about 1½ inches. The eggs are usually laid in tufts of dead grass, but may be found upon blades of grass and even upon old cornstalks.

Remedies. The "army worm" has many enemies among birds and parasitic insects so that it rarely reaches such numbers as to become a source of alarm.

1. Burning over pastures and meadows in the spring or fall prevents their increase. As the insect breeds largely in rank grass, such as is seen bordering swamps, it is well to burn such in the spring or fall and thus destroy the wintering quarters of the insect.

2. Where the worm has appeared, a good plan is to plow a furrow with its perpendicular side next the field to be protected, and as the worms collect in it failing to climb the steep side, you can destroy them.

3. Where Paris green may be safely used, it may be sprayed upon the plants likely to be first attacked by the advancing worms.

I have referred to the above insect on account of its being one of the most interesting cases of the injury done by an insect during the summer of '94, especially in the localities from which the specimens came. As the attack created considerable alarm, I have no doubt the above description of the insect and its habits will be read with interest by many and prove instructive to some.

RASPBERRY ANTHRACNOSE (*Glœosporium venetum*) —Many enquiries have been received desiring information regarding this parasitic fungus upon the raspberry. Specimens were frequently received which seems to indicate that the trouble is quite common. On this account I have thought a brief description of the disease may be of use in enabling readers to identify the fungus.

Raspberry canes affected are sometimes spoken of as attacked with "cane rust" or "sun scald."

The blackcap variety seems most liable to attack, but it also appears on the red.

On the shoots attacked, small purplish spots irregularly scattered on the surface appear; these, as the season advances, enlarge and assume an ash-colored appearance in the centre, with purplish border surrounding each spot. At first the spots are very small, but, as the disease develops, the spots unite and show a more lengthened than oval shape.

RASPBERRY ANTHRACNOSE.

These spots are also found upon the leaf-stalks and even the leaves themselves; but they are most characteristic upon the canes, where they are readily seen.

It is in the second year that the effects of the fungus show themselves, especially when the canes bear fruit. If the canes are badly attacked the fruit never fully developes and the leaves present an unhealthy appearance, turning yellow and then brown.

The best results in the treatment of this disease have been obtained from the use of dilute Bordeaux mixture (4 lbs. copper sulphate, 4 lbs. fresh lime, and 50 gallons water.) 1st application, early in the spring before the leaves open; 2nd, soon after the young canes appear, and these only sprayed; 3rd, about two weeks later spray young canes again; 4th, the young canes just before blooming. Cut out and burn the fruiting canes each summer as soon as the crop is gathered.

DISEASES AFFECTING THE GRAPE.

Having received replies from 551 persons to whom circulars were sent through the medium of the Department of Agriculture for information regarding diseases affecting the grape, the writer is able to present a summary of these replies, and, as the time is now opportune, give a description of four of the most common parasitic plants attacking the grape, and also give information as to the best means to prevent the spread and effect of these diseases.

Of the correspondents making returns, 120 report Downy Mildew, 105 Powdery Mildew, 106 Black Rot, and 14 Anthracnose.

The county of Welland reported 60 per cent. loss, Wentworth 70 per cent., Lincoln 75 per cent., and Essex 50 per cent.

As to varieties most liable to attack, 116 correspondents report Rogers' hybrids, 35 Concord, 23 Clinton, 20 Niagara, 15 Brighton, and 12 Delaware.

The year 1889 is frequently referred to as the season when these diseases were first noticed to any considerable extent, and they have been on the increase since. Grape growers are awakening to the importance and necessity of fighting these foes, as may be seen from the fact that of those in communication with the Department in reply to the circular above referred to, 59 report using sulphur, 45 Bordeaux mixture, 12 copper sulphate, 10 ammoniacal solution of copper sulphate, and 3 eau celeste. The consensus of opinion is that favorable results followed the use of the above named fungicides, especially in the case of the Bordeaux mixture.

Thirty-two persons report that they found farmyard manure to favor the development of these fungoid pests. Many find ashes an excellent fertilizer for the grape vine.

Fungoid Pests.

The grape being a plant that produces a large amount of foliage and fruit, it is not a matter of surprise that it should have a number of enemies among insects and parasitic plants. In this bulletin we wish to direct the attention of readers to four plants that are found affecting the grape injuriously, by deriving their nourishment from it as parasites upon its leaves, canes and fruit.

No group of plants has received more attention, since the establishment of experiment stations, than what is called the fungi, and no investigations have been more productive in practical results than those which have been followed to ascertain the nature and remedy for plant diseases, caused by species of fungi. Until the microscope was discovered and its manipulation simplified, we knew very little concerning the life history of these pests, most of them being exceedingly minute.

General Characteristics of the Fungi.

The fungi include most of these parasites, that commence life from a spore which to some extent corresponds to a seed, the starting point for the higher forms of plant life, as the grape, etc. Spores are exceedingly small, most of them microscopic, have a very thin covering, germinate from no particular point, and have no embryo. Thus you will perceive they differ very materially from a seed, which is visible, has a well-defined covering, germinates from a particular point, and contains an embryo, that develops into a plant capable of producing flowers and seeds.

The fungi also differ from other plants in having no green coloring matter (*Chlorophyll*) in them, and thus cannot elaborate food from inorganic material; they must derive their food from material elaborated by plants that do possess Chlorophyll. They therefore live on organic matter, some on dead, such as mushrooms, others on living, such as mildews, smuts, etc. The latter are true parasites, and are very injurious by sapping the vitality from the plants upon which they are found. Among these fungi we find four frequently parasitic upon the grape. Before discussing these specific forms, it may be of service to the reader to outline the usual development of a parasitic fungus from the germination of spores till spores are again produced. Spores being exceedingly small are readily transported by the wind, and soon reach a suitable place for germination upon some plant, which is termed the host. The minute germinal thread which at first appears soon penetrates the tissue of the host plant and continues growing among the cells, from the contents of which it derives nourishment. As growth proceeds, thread-like structures (*hyphæ*) increase, and usually form quite a complicated mass (*mycelium*) pervading the tissues of the affected plant. The growth of this has a very disastrous effect upon the plant attacked, by lessening its vitality and general growth. At the proper time certain structures arise from the mass (*mycelium*). These vary much in the different fungi; but all are concerned in the production of spores, which falling upon proper places and surrounded by favorable conditions, soon germinate and perpetuate the disease.

This first form of spore (summer spore) is usually developed early in the season and in great numbers, their use being the rapid spread of the fungus. Their vitality is chiefly confined to the season in which they are produced; but later in the season, among the threads of the mass, more complicated structures appear. The elements they contain mingle together and give rise to much more durable spores (winter spores) which are destined to carry the trouble into another season.

They are capable of surviving more adverse conditions than the summer spores. By burning up affected material in winter or early spring, before the winter spores have germinated, we can prevent to a considerable extent the spread of a fungus. Remembering this outline, for it is much the same in all these parasitic fungi, the reader will be in a position to understand the following descriptions of certain specific forms feeding among the tissues of the grape.

Downy Mildew or Brown Rot (*Peronospora viticola*).

This fungus which moisture seems to favor, attacks all green portions of the grape and appears about June. As soon as a spore falls upon the leaf it germinates, and the germinal thread penetrates the tissue and passes between the cells, not into them; but small growths develop on the penetrating threads and these (*haustoria*) dip into the cells and abstract nourishment for the growing fungus. An examination of these minute threads by a microscope reveals no partitions, such as are observable in the threads of "Black Rot." As development continues the thread-like structures of the fungus increase and form a mass (*mycelium*) which pervades the host-plant; from this arise minute stalks, that made their appearance through the small opening (*stomata*) on the undersides of the leaves, usually several in one opening. (See fig. 1.) They appear in such numbers as to form patches of a mouldy or frost-like appearance; opposite to these on the upper side of the leaves are pale green spots, which gradually turn brown, indicating a sickly condition of the leaf. These stalks under the microscope present quite a tree-like form as seen in the figure, and bear on the ends of the branches many oval bodies (*conidia*) which drop off as soon as they mature. If they reach favorable conditions, the contents soon break up and spores are formed; these pass out, each capable of moving about, and after reaching a proper resting place, they germinate and the fungus again develops, as already described. These are summer spores and aid in spreading the fungus rapidly. Later in the season, about autumn, the winter spores are produced among the threads of the mycelium by a sexual process. They have much thicker walls and are fitted to withstand the adverse conditions of winter, and thus carry the trouble into another year. Hence the advisability of destroying leaves, etc., that might be suspected of having these winter spores upon them. When the shoots are attacked it is indicated by dark colored spots slightly depressed, but not so deep as in the case of Anthracnose. Affected fruit fails to develop, it gradually becomes withered and brown. (See fig. 2.) Hence the term "Brown Rot" applied to distinguish it from "Black Rot." In the latter the berries are very much wrinkled and dried up. (Compare figures A and B.)

The Downy Mildew in its growth bears a close resemblance to the fungus causing "Potato Blight," described by the writer in the O. A. C. Report for 1886. A great many "blights" on different plants, turnips, lettuce, onions, cabbage, etc., are caused by parasites in the order (*Peronosporeæ*) to which the above belong.

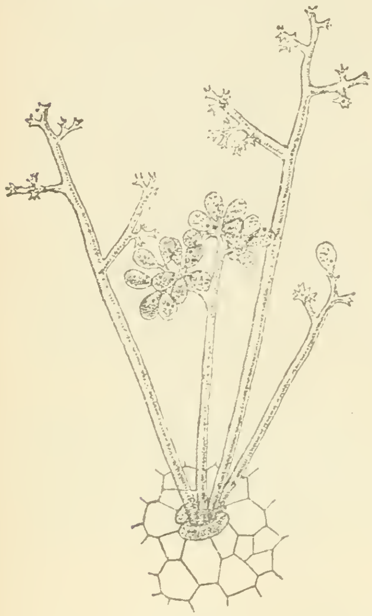
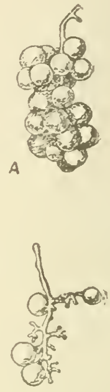


Fig. 1.

Fig. 2.



Remedies. 1. Eau celeste, a mixture of copper sulphate ammonia and sodium carbonate (see under "Conclusions" at the end of this bulletin) has been used very successfully against Downy Mildew by spraying as follows: 1st application ten days before the vines blossom; 2nd just after the blossoms fall, and 3rd, about two weeks later. 2. The Bordeaux mixture, copper sulphate, lime and water, as also referred to in the conclusions, is effective.

Black Rot of the Grape (*Laestadia Bidwellii.*)

This fungus, aided by moisture and high temperature, is often associated with rank and succulent growth. It affects leaves, shoots and berries, usually making its appearance in June, in the form of circular reddish brown spots, of lighter color in the centre. They are more distinct on the upper surface of the leaf, than on the lower. Around these diseased parts, minute dark colored pimples can be seen. These show the various stages in the growth of the fungus which we shall describe, when referring to the attack upon the fruit. On the shoots the disease causes long brown spots somewhat depressed. It is not in the attack upon either leaves or shoots that much damage is sustained, but when the fungus reaches the fruit. The berries are attacked shortly after the leaves show the presence of the disease. The trouble often shows itself as a small brownish spot on the surface, near the stem end; this gradually spreads and covers the whole surface, changing in color, till it becomes quite black and the berry eventually withers, assuming a dry, shrivelled-up condition. (See figs. A and B, showing unaffected and affected fruit.) An examination of the surface reveals many small black pimples in which the fungus can be detected; these pustules can be seen by the eye, but sections of them under the microscope show many interesting stages in the life history of this parasite.

Its thread-like structures with partitions during development not only grow between the cells but in some cases penetrate them. Among the tissues of the shrivelled berries minute cavities are seen in which spores are developed. These cavities may be quite near each other, but contain entirely different forms of spores, for we find four kinds connected with the spread of this fungus. When mature the spores escape through minute openings on the surface of the pimples referred to.

Fig. 3.

Fig. 4.

Among the most important germs in spreading the fungus during summer are the *Stylospores*, oval in outline and borne on very small stalks attached to the walls of certain cavities, (*pycnidia.*) As soon as mature they separate from the stalks and pass out of an opening on the top of a pimple. (See fig. 3.) Other cavities (*spermagonia*) give rise to still smaller and more elongated spores (*spermatia*) which mature and also pass out through an opening.

Ascospores, oval in outline, are not developed till the "rot" has been fully matured, and may be seen upon diseased berries in the spring. They are winter spores and are concerned in the perpetuation of the fungus from season to season. On this account it is very important to destroy them as far as possible. The cavities (*perithecia*) containing these are largely occupied by flask-shaped organs (*Asci*), (see fig. 4) in each of which are eight of these oval spores; these on reaching maturity escape from the cavities to find a new starting point on the plant.

Conidia, a fourth form of spore, are not so common as the others and are more usually found growing upon the surface of the pimples, than in cavities inside; they are oval and appear at the ends of stalks, showing well-marked divisions, from which they drop off, when mature. The *Stylospores* and *Ascospores* are the most important in the propagation of "Black Rot."

Remedies. 1. Some have succeeded in preserving the fruit from attack by enclosing the bunches in paper bags, as soon as the flowers are fertilized. 2. Spraying with Bordeaux mixture (see Conclusions) is a very successful fungicide against "Black Rot."

Powdery Mildew. (*Uncinula spiralis.*)

This fungus is quite different from either of the preceding in its form and habit; it prefers a dry atmosphere and confines its attack largely to the external portions of the affected parts. It appears about midsummer in the form of grayish white patches on the upper surface of the leaves, sometimes on the shoots and even berries. After it has developed for a time it throws up erect threads, each bearing single spores (*conidia*) at its summit; they drop off, and are followed by others taking their place, (see fig. 5.) and thus keep up a supply of summer spores. When the season advances many peculiar, minute, nutlike structures (*perithecia*) (see fig. 6.) are developed among the threads of the mass (*mycelium*). Within these, in small flask-shaped bodies (*Asci*), the winter spores (*Ascospores*) are developed, to continue the disease another year.

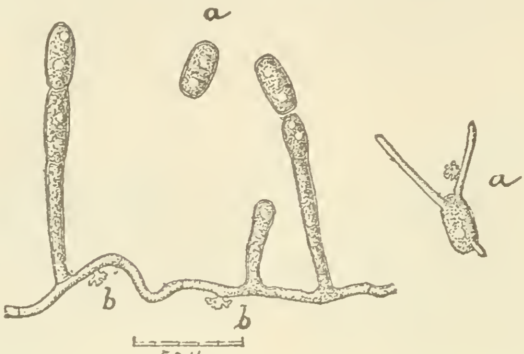


Fig. 5.

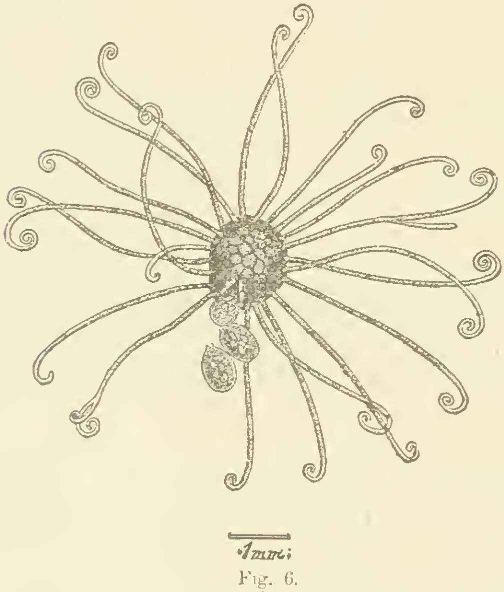


Fig. 6.

Remedies. § 1. Sulphur has been very successful against this mildew by applying it, 1st. Twelve days before bloom; 2nd, when the plants are in bloom, and 3rd, three weeks later. § 2. Bordeaux mixture is also successful.

Anthracnose (*Sphaceloma ampelinum.*)

Continued damp weather favors the development of this fungus, which may be found on all green parts, but more especially on the cane where it appears as small brown marks, which sometimes unite and form somewhat lengthened spots, the centres of which are sunken with a well raised border. The growing fungus does not extend deeply into the tissues, although the central area is depressed; but the affected parts rupture and spores are produced on the ends of mycelial threads; these drop off and form new centres of the disease. (See fig. 7). On the leaves it produces minute brownish spots of lighter color in the centre and raised borders surrounding the whole.

When the berries become affected, they show brownish or blackish specks with a more or less circular outline; the centres of these become gray, and surrounding this sometimes a conspicuous red ring appears with a dark border on the outside of it. This presents such a characteristic appearance, that the term "Bird's-eye Rot," (See fig. 8) has been applied to the disease. Berries attacked do not wither or turn brown as those referred to in "Black Rot" and "Brown Rot"; but the portion affected becomes somewhat wrinkled, and the berries assume an irregular shape. The spores of this seem to live during the winter upon the diseased portions of fruit, leaves or shoots.

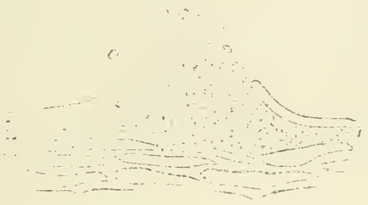


Fig. 7.

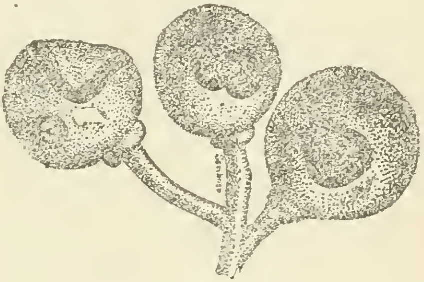


Fig. 8.

Remedies.—Sulphur has given good results. But it would be a great improvement to spray the canes with a solution of copper sulphate (1 lb. copper sulphate in 20 gals. water) before the buds start. The careful and thorough application of Bordeaux mixture, as directed in the Conclusions of this bulletin, will be followed by but very slight if any attacks upon the grape, by the four parasitic plants discussed.

Conclusions.

From a study of the nature and habits of the fungi discussed in this bulletin, we make the following conclusions:

1. Destroy as far as possible all affected material, such as diseased leaves, canes and berries.

2. Before the buds start spray with a solution of copper sulphate (1 lb. in 25 gals. water).

3. After growth starts spray once at least before the vines bloom, using Bordeaux mixture (see below); if twice, make the first application as soon as the leaves appear and the second just before blooming.

4. After bloom, as soon as the fruit sets, make three applications at intervals of 12 to 15 days, with the Bordeaux mixture.

The coloring of the berries by this mixture may be overcome by using in the last application an ammoniacal solution of copper carbonate (see below); or it may be removed by dipping the fruit in a solution of vinegar (2 quarts vinegar in 10 gals. water) and then rinsing it in clean water.

5. The best fungicides to prevent the diseases of the grape are (*a*) copper sulphate, 1 lb. in 25 gals. water, for early treatment; (*b*) Bordeaux mixture, 6 lb. of copper sulphate, 4 lb. fresh lime, 45 gals. water. In making this we grind the copper sulphate and dissolve it in a few gals. of water, slake the lime with about 6 gals. of water; after cooling strain it through some coarse sacking into the barrel that contains the copper sulphate solution and stir it well, adding the rest of the water necessary to make up the mixture; (*c*) eau celeste, 2 lb. copper sulphate, 2½ lb. washing soda, 2 pints ammonia and 25 gals. water. Dissolve the copper sulphate in 2 gals. of water, the 2½ lb. washing soda in another vessel of water, mix these and when chemical action has ceased add 2 pints of ammonia; (*d*) ammoniacal solution copper carbonate; 3 oz. copper carbonate, 2 pints of ammonia, 25 gals. water. Dissolve the 3 oz. of copper carbonate in 2 pints of ammonia, and when about to use dilute with 25 gals. water. Of these the Bordeaux mixture is likely to rank first.

6. These mixtures can be applied with great efficiency by using a knapsack sprayer with Vermorel nozzle or a barrel pump, drawn upon a stone-boat between the rows.

IMPURITIES IN CLOVER SEED.

Notwithstanding the advancement that has been made in the thorough cultivation of land by the farmers of Ontario, we find the number of species among weeds is on the increase.

This likely arises from a tendency among farmers to introduce seed from other places and not confine themselves for seed to the product of their own farms. Among the seed frequently changed, we may place clover, which on account of its size and form is very difficult to rid of impurities ; on this account we may consider it as being a chief source of the introduction of weeds into many farms. The writer obtained sixty samples of clover seed from various parts of Ontario for the purpose of examining them in reference to their purity, cleanliness and vitality. These samples were obtained from wholesale seedsmen, seedsmen selling on commission, and from farmers. The results from an examination of these are interesting, as they show a marked difference in the number of weeds found in each.

In testing the samples three things were kept under consideration :

1. The *purity* of the seed ; that is, the extent to which it was true to its kind.

2. The *cleanliness* of the seed ; referring to its freedom from the seeds of weeds and foreign substances such as bits of stone, glass, etc.

3. The *vitality* of the seed with reference to its germinating power, when placed under favorable conditions.

Testing seeds for these three characteristics is now becoming quite a common practice among seedsmen of reputation, both in the United States and Canada ; and thus we find almost invariably in connection with the wholesale seed houses a *testing-ground*, the presence of which has a great tendency to strengthen the confidence of customers.

In England and Germany the law demands seedsmen to guarantee the *vitality*, *purity* and *cleanliness* of the seeds offered for sale.

This has had a most beneficial effect upon the seed sold in those countries to farmers and gardeners, but it does not interfere with export trade, so that while great care may be exercised to sell a good article at home, yet a much inferior may find its way into our country. Much loss is sustained yearly from seed being not *true* to name, not *clean* and low in *vitality*, and as yet there seems no redress for the unfortunate purchaser in Ontario. It is claimed that most seedsmen are sufficiently jealous of their reputation to be a safeguard against imposition. This may be true to some extent, but it is feared there are many who run the risk of selling seeds they would not if they knew the law was ready to protect the unlucky purchaser. There is no doubt the use of "testing-grounds" by seedsmen has lessened the trouble very much.

We would scarcely imagine that men would stoop to grind up quartz, sift and color it, so as to adulterate clover seed, and yet this has been conclusively shown to have been followed by some. Cases have occurred in which men have had hundreds of pounds of this spurious material sold to them in adulterated clover seed. Clover seed may be considered one of the most impure seeds in the market.

In making our observations, one-half ounce of the seed was taken from the sample obtained and the number of weed seeds, particles of sand, dirt, etc., carefully counted. The species of weed seed was also noted. One hundred seeds were tested for *vitality* by placing them in conditions favorable to germination, such as moisture, suitable temperature and darkness. The number that sprouted showed the per cent. vital.

The vitality of seeds can be fairly well ascertained by placing seeds between sheets of blotting paper laid on sand, and keeping the paper moist. The samples should be where the temperature is not lower than that of the air. If it can be kept about 75° to 85° F. all the better. Some place the seeds on a piece of flannel and cover them also with flannel. The whole is placed in a saucer or plate, kept moist in a warm room and allowed to germinate. If one hundred seeds are used the number germinating indicates the per cent. vital.

If seeds are scattered upon a piece of black cardboard the foreign grains, etc., can be readily detected.

Tabulated statement showing impurities in Clover Seed.

Where from.	No. of weed seeds in ½ oz.	Other impurities, sand, etc	Per cent. of weed seeds.	No. of weeds to clover plants in a square yard.		Kind of clover.	Vitality per cent.	Kind and number of weed seeds. Grass.	White cockle.	Sorrel.	Campion.	Chicory.	Rib-grass.	Ragweed.	Smart-weed.	Chess.	Black bindweed.
Uxbridge ..	117	some	.58	4	to 789	A	93	103	3	10	1						
" ..	135	much	1.44	10	733	R	94	92	27			4	12				
" ..	420	"	2.1	17	776	A	92	206	78	103		7	19				
Guelph	485	little	5.17	38	705	R	90	273	61	72		5	61	3		10	
Lindsay	607	some	6.07	24	769	A	93	550	24			26					7
*Toronto		clean				R	95										
"	9	"	.09	.3	793	A	95	7	2								
* "	6	"	.06	.4	743	R	98	3	2	1							
"	30	some	.3	1	792	A	96	21	9	6		4					
Guelph......	47	little	.5	4	739	R	92	25	7	12	3						
St. Marys .	78	"	.39	3	790	A	94	61	9	7						1	
* " ..	2	much	.02	.15	743	R	93	2									
*London	4	little	.04	.31	743	R	95	2		2							
" ...	64	much	.32	2.5	790	A	96	40	12				12				
*Hamilton ..	4	clean	.04	.31	743	R	98	4									
" ..	57	fair	.28	2	791	A	97	12	42								3
Toronto	168	some	.8	6	787	A	91	100	56			2				2	8
* "	2	clean	.02	.15	743	R	94	2									
Bowmanville.	4	some	.04	.31	743	R	94	1		3							
"	22	clean	.11	.8	792	A	96	8		3	9	1				1	
*Toronto	4	"	.04	.31	743	R	97	1		1	2						
"	34	fair	.17	1	792	A	87	14		11	9					1	
Waterford ..	16	"	.17	1	742	R	90	4	4	5	3						
" ..	1,824	clean	9.	72	721	A	83	4		1,820							
Simcoe......	9	little	.09	.7	742	R	79			9							
"	120	"	1.2	9	734	R	89	4		116							
† "	4,540	much	22.7	180	613	A	49			4,540							
St. Marys ..	748	little	3.7	29	764	A	91	34		714							
Vaughan....	540	fair	5.7	42	701	R	89						540				
St. Marys ..	106	"	1.1	8	735	R	87	85		12	1	2			5		1
Guelph ...	51	"	.54	4	739	R	83	12	4	30		4		1			
Brantford ..	16	clean	.17	1	742	R	83	5		6		2				3	
Guelph......	4	some	.04	.31	743	R	87	4									
"	51	fair	.54	4	739	R	90	28		10	13						
"	1,712	much	8.5	67	726	A	69	720	360	540		92					
Embro	2	clean	.01	.1	793	A	93	2									
"	1	"	.01	.07	743	R	93						1				
Woodville ..	6	"	.06	.4	743	R	89	6									
" ..	36	"	.18	1	792	A	90	4	32								
Huron Co ...	43	fair	.45	3	740	R	92	10		27		2	4				
" ...	765	much	3.8	30	763	A	87	300	22	443							
Guelph	805	fair	4.02	31	762	A	90	39		742		22		2			
"	36	clean	.3	2	741	R	92	2		34							
Middlesex ..	14	much	.07	.5	792	A	89	6	7			1					
" ..	8	"	.08	.61	743	R	84	8									
Kingston....	16	"	.08	.61	793	A	65		15			1					
"	1	clean	.01	.07	743	R	97	1									
Bruce Co....	120	fair	.06	4	789	A	89	63	15	39		3					
"	8	clean	08	.61	742	R	94	5									
Oshawa	82	"	.82	6	737	R	89	67	3	7					5		
Waterloo Co.	2	"	.02	.15	743	R	95	2									
Dundas	5	"	.05	.3	743	R	93	3									
"	200	fair	1.	7	786	A	84	22		175				3			
Russell Co ..	15	clean	.16	1	742	R	92	10	1								
Owen Sound.	210	some	1.05	8	785	A	82	160	30	18		2					
Guelph	55	fair	.27	2	791	A	85	17	33				5				
*Toronto	1	clean	.01	.07	743	R	94	1							4		
* "	10	"	.05	.03	793	A	93	3	7								
Kingston....	7	"	.07	.49	742	R	92			2			4				1
Toronto	15	"	.07	.5	792	A	91		5								

1 lb. of alsike clover=640,000 seeds. 1 lb. of red clover=300,000 seeds. Rate of sowing used in the above calculations: Alsike, 6 lb. to the acre; red clover, 12 lb. to the acre. Under the column "Kind of clover," A indicates alsike, R red. * Were obtained from wholesale seedsmen. † A sample as obtained from a farmer before cleaning. 117 weeds in ½ oz. alsike would give 22,464 weeds in an acre. 135 weeds in ½ oz. red clover would give 51,840 weeds in an acre.

The following figures represent the forms of the seeds of some of the most common weeds, enlarged and natural size :


RIB-GRASS.


OX-EYE DAISY.

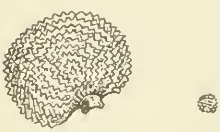

CHICORY.

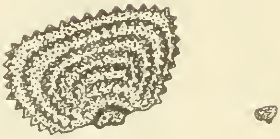

SORREL.


RAGWEED.


BINDWEED.


BLACK BINDWEED.


WHITE COCKLE.


BLADDER CAMPION.


CHESS.

Of the sixty samples examined, 53 contained grass seeds ; 27, seeds of white cockle (*Lychnis vespertina*) ; 32, sorrel (*Rumex acetosella*) ; 8, Campion (*Silene inflata*); 17, chicory (*Cichorium intybus*) ; 9, rib-grass (*Plantago lanceolata*) ; 4, ragweed (*Ambrosia artemisiaefolia*) ; 3, smartweed (*Polygonum Pennsylvanicum*) ; 5, chess (*Bromus secalinus*) ; 5, black bindweed (*Polygonum convolvulus*).

Conclusions.

1. The number of seeds present is of more importance than their weight in determining the number of weeds.

2. The presence of weed seeds is far more serious than any adulteration from pieces of quartz, gravel, wood, etc.

3. It is a great mistake to buy cheap seed, as it is likely to possess poor vitality by being old and to contain the seeds of weeds. Seedsmen who sell pure seed require expensive machines to clean it, and therefore cannot be expected to sell their seed as cheap as those who take but little pains to have a good article.

Nos. 6, 8, 12, 13, 15, 18, 21, 57, 58 were obtained from wholesale seedsmen ; No. 27, a sample from a firm before it had been cleaned, while most of the others were from commission merchants or farmers.

4. Among the most common foreign seeds likely to be in clover are : Grass seeds, white cockle, sorrel, rib grass, ox-eye daisy, chicory, smartweed, chess, black bindweed, false flax and thistle.

5. Every farmer should have a collection of the seeds of weeds. It would not be a difficult matter to collect a sample of each ; this would be of great assistance in identifying the seeds of weeds which might become a great pest.

6. Farmers should examine carefully all new seeds from other places. A very few weed seeds in half an ounce of seed will be thousands in what is required to sow an acre. (See table.)

7. The samples examined were quite true to name ; the vitality of the seeds was high, many reaching over 90 per cent. It is usual to deduct 8 per cent. from the laboratory test to represent the field vitality, where conditions are not so favorable to germination.

HOW TO PREVENT SMUT.

Clean Seed. If there are no smut spores upon the grain sown, there will not likely be smut upon the plants that grow from it.

Hot Water. It has been conclusively shown that smut spores upon wheat or oats can be destroyed by immersing the grain for fifteen minutes in water at a temperature of 132°F. This not only destroys the smut spores, but hastens the germination of the grain and improves the general growth of the plants. The difficulty in this treatment is to maintain a temperature of 132°, for if it falls below 130° or rises beyond 135, the remedy is likely to fail.

Any way by which this temperature of 132°F. can be kept up and the grain immersed in it twelve to fifteen minutes may be adopted. Some persons take two vessels, one containing water at 110°F to 120°F, the other water at 132°F. Whatever quantity of grain is taken each time for treatment, it should be much less in bulk than the water into which it is to be immersed. The grain is put into a basket or bag made from loosely woven material, so as to permit the water to pass in and out readily without the grain straining through.

The grain is first put into No. 1 a minute or two, raised up and down a few times so that it may be thoroughly wet, and heated so as not to lessen the temperature of No. 2, into which it is next plunged and moved about for twelve to fifteen minutes, so as to be thoroughly saturated. It is very important to keep the temperature of the water in this vessel at 132°; if it sinks below add warm water and if it rises above add cold water, never allowing it to reach higher than 135° or lower than 130°. The grain, after having been raised and lowered into No. 2 several times for twelve to fifteen minutes, is lifted out and cooled, either by dipping it into cold water or by pouring cold water upon it.

Considerable smut may be removed before treating with hot water, by placing the grain in a vessel of cold water and stirring it about for thirty minutes. The smutty grains will float to the top and may be skimmed off.

Chemical Solutions. In treatment by using solutions of chemical compounds, there is always a risk of injuring the germinating power of the grain.

But this method has been long followed with much success, usually more in the case of wheat smut (bunt) than that upon oats (loose smut).

In both cases the *hot water* remedy ranks the most successful. There are many solutions that have been tried, but we shall refer to only two. It is generally believed that a strong solution used for a short time is better than a weak one for a longer period, especially where the seed is to be sown by a seed-drill. When grain is allowed to soak for a long time, it does not readily pass out of the drill, and hence using a stronger solution for a shorter time is preferred.

The following are among the best solutions that have been tried :

1. One pound *Copper Sulphate* (blue vitriol) dissolved in three gallons of water. Wet the grain thoroughly with this solution and then dry it gradually or sprinkle slaked lime upon it.

2. Three pounds of *Copper Sulphate* dissolved in five gallons of water. Wet the grain thoroughly and dry by sprinkling plaster or slaked lime upon it and mix well. This quantity will be about sufficient for fifteen bushels of grain.

3. One pound *Copper Sulphate* dissolved in twenty gallons of water. Allow the seed to remain in this twelve to fifteen hours and put it in lime water for ten minutes and then dry.

4. One pound *Potassium Sulphide* (liver of sulphur) dissolved in ten gallons of water. Allow the grain to steep in this twelve hours, stirring it from time to time so as to thoroughly mix ; then spread the grain so as to dry.

5. One pound *Potassium Sulphide* dissolved in twenty gallons of water. Steep the grain in this twenty-four hours.

In closing this report I wish to express my thanks to yourself and to the Minister of Agriculture for the liberality and readiness shown to supply the equipment asked for from time to time, for the purpose of increasing the usefulness of the department over which I have the honor to preside.

Your obedient servant,

J. HOYES PANTON,
Professor of Natural History.

Ontario Agricultural College,
December 31st, 1894.

PART III.

REPORT OF

THE PROFESSOR OF CHEMISTRY.

To the President of the Ontario Agricultural College:

Sir,—It affords me pleasure to submit herewith the report of the department of Chemistry for 1894.

The changes in the order of lectures and in the text-books in my department, recommended in my report of last year and authorized by you, have proved to be wise changes. The plan of requiring the students of the third year to pay for the chemicals used by themselves, instead of paying a fee, has operated satisfactorily to all concerned.

More samples of soil, marls, wood ashes, fertilizers, etc, have been sent to our laboratory for analysis this past year than any other year since my appointment. In cases of general interest, we undertake, as far as time permits, the examination of the above materials; but in no case, since no charge is made, do we undertake analysis of a private nature, calculated to advance the interests of certain individuals or companies.

During the year just closing, and immediately after the conclusion of the third year examinations in May, we devoted several weeks to official analysis in connection with the American Association of Official Agricultural Chemists. The time thus spent was devoted to the investigation of the several methods of determining phosphoric acid in its different forms, proposed by the official reporter on phosphoric acid. The importance of this kind of work to the science of agriculture cannot be overestimated. My assistant, Mr. R. Harcourt, and myself were joined in this work by Messrs. Ferguson, McCallum and Kennedy, all of whom were members of the graduating class of 1894. To these gentlemen, I beg to extend my thanks for their assistance in ascertaining the best methods of determining phosphoric acid in soils, manures, feeding-stuffs, etc.

My report is arranged under the following heads:

The Composition of Cheese and Whey in Relation to each other.

Analysis of Soils from Lake Temiscaming District.

Analysis of Fish Manure.

Analysis of varieties of Turnips, Swedes, and Mangels.

Effects of thinning on the Composition of Roots.

THE COMPOSITION OF MILK, CHEESE, AND WHEY IN RELATION TO ONE ANOTHER.

An extensive chemical analysis of milk, cheese, and whey was begun by us early in May last, to study the constituents of milk in their relation to the yield of cheese. This line of study was suggested by the excellent work upon the investigation of cheese commenced at Geneva, N.Y., in 1891, and by important conclusions drawn therefrom. It is to study this question from the standpoint of Ontario conditions, as well as to bring new facts to light, that this line of chemical investigation has been entered into.

The principal points of the present investigation are :

1st. The degree of uniformity in the proportion of fat to casein in our milk.

2nd. The relation of the fat contained in our milk to its cheese-producing power.

3rd. The proportion of the fat of the milk lost in whey by our method of cheese-making.

4th. Fat as a basis in apportioning dividends to patrons.

5th. The average composition of our milk, cheese, and whey.

Compounds Contained in Milk, Cheese, and Whey.

Water. Milk contains about 87.6, cheese 34.6, and whey 93.4 per cent. of water.

Fat. The fat of milk, cheese, and whey is a mixture of glycerol salts of several acids, and is the same substance that forms so large a portion of natural butter. Milk contains about 3.5, cheese 35.5, and whey 0.24 per cent. of fat.

Casein. This is the chief nitrogenous substance in milk, and is commonly called curd. This curd or casein can be precipitated in milk by acids or by the use of rennet. Milk contains about 2.3, cheese 22.1, and whey 0.13 per cent. of casein.

Albumen. Albumen is similar in composition to casein ; but, unlike it, is not thrown down or made insoluble by acids or the action of rennet. In cheese-making, the albumen passes more or less completely into the whey. The amount in milk is about 0.7, in cheese 1, and in whey 0.76 per cent.

Total Solids. By this term are meant all the compounds (except water) taken together.

Plan of Securing Samples for Analysis.

The milk used was from our herd of twenty cows. Each cow's milk was tested with a Babcock tester as soon as drawn, and the milk from the herd divided into two lots according as it indicated a high or a low per cent. of fat. Lot L represented milk low in fat; lot H milk high in fat. In addition, milk was purchased from two or more neighboring farmers and added to lot L or H, according to whether the per cent. of fat was low or high. After being thoroughly mixed, 300 pounds were taken from each lot and put into separate vats to be made into cheese. From each vat a sample for chemical analysis was taken; and to replace these samples, equal quantities from lots L and H were added to their respective vats. The milk of each vat, being exactly 300 pounds, was made into cheese by a skilful maker, under exactly similar conditions. Cheese was made in this way every day during the first week of May and of June. Samples of milk were taken for analysis on the 2nd and 7th days of May, and 4th, 6th and 8th days of June. The cheese and whey of these dates were also sampled and analyzed. The following tables give duplicate analyses of these samples of milk, cheese and whey.

Lot H represents the rich milk, in which the per cent. of fat is 3.915. It took an average of 9.4 pounds of this milk to make one pound of cheese. Lot L represents the poor milk, containing 3.302 per cent. of fat and requiring 10.3 pounds of milk to make one pound of cheese. Out of the following tables we have selected all the full duplicate analyses and have made from them our general averages for milk, whey, green cheese, and cheese one month old.

COMPOSITION OF MILK, CHEESE AND WHEY.—FIRST PERIOD.

Lot H.	Per cent. of water.			Per cent. of solids.			Per cent. of fat.			Per cent. of casein.			Per cent. of albumen.			Pounds green cheese from 100 lb. milk.
	Milk.	Cheese.	Whey.	Milk.	Cheese.	Whey.	Milk.	Cheese.	Whey.	Milk.	Cheese.	Whey.	Milk.	Cheese.	Whey.	
May 2nd I	87.756	36.061	93.170	12.244	63.939	6.830	3.474	33.775	.125	2.181	17.337	.356	.744	....	.412	....
May 2nd II	88.235	35.752	93.747	11.765	64.248	6.253	4.325	31.619	.183	....	....	.355	....	....	.332	....
Average	87.995	35.906	93.458	12.005	64.000	6.542	3.899	32.697	.154	2.181	17.337	.355	.744	....	.372	9.91
May 7th........ I	87.743	35.931	93.180	12.257	64.069	6.820	3.462	32.994	.406	2.280	21.712	.058	.757	2.356	.800	....
May 7th........ II	88.061	36.089	94.902	11.937	63.911	5.098	3.908	....	.350	2.230	22.725	.068	.588	1.037	.813	....
Average	87.902	36.010	94.042	12.098	63.990	5.958	3.685	32.994	.375	2.255	22.218	.068	.672	1.697	.806	9.75
June 4th I	87.343	34.700	92.920	12.657	65.300	7.080	4.387	37.687	.216	2.445	20.981	.039	.561	956	.892	....
June 4th II	86.710	34.052	92.952	13.290	65.948	7.048	4.290	38.601	.191	2.445	20 800	.071	.742	1.300	.822	....
Average........	87.026	34.376	92.936	12.973	65.624	7.064	4.338	38.144	.203	2.445	20.890	.055	.651	1.128	.857	11.25
June 6th I	86.893	33.628	....	13.108	66.372	....	3.660	36.546	....	2.556	22.903	....	.725	.609	....	....
June 6th II	86.875	33.287	....	13.125	66.713	....	3.650	35.437	....	2.181	22.868	....	1.056	.713	....	....
Average....	86.883	33.457	....	13.116	66 543	....	3.655	35.991	....	2.368	22.885	....	.891	.661	....	10.91
June 8th I	87.081	34.747	93.269	12.919	65.253	6.731	4.004	34.274	.186	2.631	22.025	.143	.491	.706	.757	....
June 8th II	87.142	35.115	....	12.858	64.885	....	3.996	33.961	.210	2.162	22.356	.151	.971	.837	.744	....
Average	87.111	34.931	93.269	12.888	65.069	6.731	4.000	34.117	.198	2.396	22.190	.147	.781	.772	.750	10.83
Average of all	87.383	34.936	93.426	12.616	65.063	6.574	3.915	34.788	.232	2.329	21.104	.156	.747	1.064	.696	10.53
Lot L.																
May 2nd I	87.897	35.216	93.175	12.103	64.784	6.825	3.446	33.806	.120	2.131	17.212	.200	.694	....	....	....
May 2nd II	87.951	35.167	93.200	12.049	64.833	6.800	3.518	34.456	.164	2.081	....	.187	.637	....	....	....
Average........	87.924	35.191	93.187	12.076	64.809	6.813	3.482	34.131	.142	2.106	17.212	.193	.665	2.568	....	9.25
May 7th........ I	88.086	36.117	93.196	11.914	63.883	6.804	3.237	33.221	.249	2.380	21.931	.100	.651	....	.800	....
May 7th........ II	88.166	36.167	93 191	11.834	63.833	6.809	3.149	32.201	.325	2.460	....	.093	.477	....	.913	....
Average......	88.126	36.142	93.193	11.874	63.858	6.807	3.193	32.211	.287	2.420	21.931	.096	.564	1.572	.875	9.19
June 4th I	88 113	35.682	....	11.887	64.318	....	3.091	23.872	.214	2.176	22.162	.065	.730	1.769	.985	....
June 4th II	88.119	35.001	95.180	11.881	64.999	4.820	3.070	34.525	.210	2.256	23.034	.065	.556	1.103	.891	....
Average........	88.116	35.341	95.180	11.884	64.659	4.820	3.080	34.196	.212	2.216	22.598	.065	.643	1.436	.938	9.42
June 6th I	87.837	35.021	....	12.163	64 979	....	3.140	35.126	....	1.993	22.381	....	....	.725	....	....
June 6th II	87.680	34.779	....	12.320	65.221	....	3.248	35.087	....	2.100	21.525	....	....	2.100	....	....
Average........	87.758	34.900	....	12.242	65.100	....	3.194	35.106	....	2.046	21.953	....	.779	1.412	....	9.92
June 8th I	87.469	35.700	94.032	12.521	64.300	5.968	3.564	33.584	.205	2.362	20.637	.068	.831	....	.889	....
June 8th II	87.425	35.804	93.399	12.575	64.196	6.601	3.564	33.468	.235	2.293	....	.059	.963	....	.890	..
Average........	87.447	35.752	93.715	12.548	64.248	6.284	3.564	33.526	.220	2.327	20.637	.063	.897	1.359	.889	10.33
Average of all	87.874	35.465	93.819	12.115	64.535	6.181	3.302	33.834	.215	2.223	20.866	.104	.709	1.669	.900	9.62

Table showing average composition of milk, whey and cheese.

———	Water.	Total solids.	Fats.	Casein.	Albumen.	Sugar, ash, etc.
Milk.						
Average of 18 duplicate determinations of 9 distinct samples	87.687	12.318	3.546	2.279	0.704	5.789
Average for 1893 at 48 American factories.	87.280	12.72	3.77	2.48	0.69	5.78
Whey.						
Average of 12 duplicate determinations of 6 distinct samples	93.435	6.564	0.239	0.130	0.759	5.436
Average for 1893 at 48 American factories.	93.00	7.00	0.38	0.86		5.76
Green Cheese.						
Average of 10 duplicate determinations of 5 distinct cheeses	34.601	65.399	35.511	22.103	1.082	6.703
Average for 1893 at 48 American factories.	36.84	63.16	33.90	23.32	....	5.94
Cheese one month old.						
Average of 12 duplicate determinations of 6 distinct cheeses	32.529	67.471	36.061	18.607	5.328	7.475

The above table shows a marked degree of uniformity between Canadian and American averages.

As a check upon the amount of the fat of the milk retained in the cheese, fat determinations of cheese were made directly, and also by difference between the fat lost in the whey and that contained in the milk. Making allowances for the difficulty of determining accurately the fat in cheese, owing to its somewhat uneven distribution, the figures in the last two columns of the following table, obtained by direct determination and by difference, agree closely, and point to a conclusion entirely in accordance with that arrived at by the Geneva station, viz, that "the loss of fat in cheese-making is quite independent of the amount of fat in milk." Another feature brought out in this table, and one which reflects credit upon the maker, is the small amount of the fat of the milk lost in the whey.

Table showing pounds of fat in cheese and whey from 300 pounds of milk.

Date.		Pounds of milk.	Per cent. of fat in milk.	Per cent. of casein.	Ratio of fat to casein.	Pounds of fat in 300 pounds of milk.	Pounds of cheese from 300 pounds of milk.	Ratio of fat to green cheese.	Pounds of fat in yield of whey.	Pounds of fat in yield of cheese.	
										By direct determination.	By difference.
L	June 4.....	300	3.080	2.216	1:0.71	9.24	28.25	1 : 3.0	.58	9.66	8.66
L	May 7.....	300	3.193	2.420	1:0.75	9.58	27.50	1 : 2.8	.78	8.86	8.80
L	June 6.....	300	3.194	2.046	1:0.64	9.58	29.75	1 : 3.1	....	10.44	....
L	May 2.....	300	3.482	2.106	1:0.60	10.45	27.75	1 : 2.6	.39	9.47	10.06
L	June 8.....	300	3.564	2.327	1:0.65	10.69	31.00	1 : 2.8	.59	10.39	10.10
	Total ...	1,500	3.302	2.223	1:0.67	49.54	144.25	1 : 2.9	....	48.82	....
H	June 6.....	300	3.655	2.368	1:0.65	10.97	32.75	1 : 2.9	....	11.79	....
H	May 7.....	300	3.685	2.255	1:0.61	11.05	29.25	1 : 2.6	1.02	9.65	10.04
H	May 2.....	300	3.899	2.396	1:0.59	11.70	29.75	1 : 2.5	.41	9.73	11.29
H	June 8.....	300	4.000	2.445	1:0.56	12.00	32.50	1 : 2.7	.53	11.09	11.47
H	June 4.....	300	4.338	....	....	13.01	33.75	1 : 2.5	.54	12.87	12.47
	Total....	1,500	3.919	2.366	1:0.60	58.73	158.00	1 : 2.6	....	55.13	....

The best method of paying for milk delivered at cheese factories is a subject of great importance to cheese-makers and patrons of cheese factories. Certainly the old method, viz., that of paying for milk according to weight alone, is not satisfactory. Of late there is a tendency, particularly among American cheese men, to pay according to the amount of fat contained in the milk. The justice of this method evidently depends upon the constancy between the per cent. of fat and the yield of cheese.

In the table the percentages of fat are arranged in the order of their amounts in both L and H, giving a range from 3.080 in L to 4.338 in H. In this table also the L and H samples are separately grouped to give an average for L samples, representing milk low in fat, and for H samples, representing milk high in fat. An examination of the figures under "ratio of fat to casein" reveals a gradual decrease with some variation in the proportion of casein to fat as the milk increases in richness. By comparing the groups it will be seen that L, with an average of 3.302 per cent. of fat, gives on an average 0 67 of one pound of casein to one pound of fat; and H, with an average of 3.919 per cent. of fat, gives on an average 0.60 of one pound of casein to one pound of fat. While it would not do to conclude hastily from these tests, covering only one week in each of two months, that milk containing 4 per cent. of fat contains less casein in proportion to its fat than milk which contains 3 per cent. of fat, still it must be admitted that these results point in that direction. Below are given the results of tests along this same line made by the Geneva Station (Bulletin 68, New Series). Samples of milk were collected 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.

Our averages for the milk poorest in fat and for the milk richest in fat are practically the same as those of the Geneva poorest and richest milk ; their tests cover one day of every week throughout the season and our tests cover the first week of May and of June ; the conclusions drawn from their results and from ours are the same, viz , that the poorest milk contains more casein for each pound of fat, but Geneva found a difference of 0 03, while we found a difference of 0.07.

From the milk having more casein for each pound of fat, more cheese for each pound of fat would be expected, than from the milk having less casein for each pound of fat. What are the facts ? Fifteen hundred pounds of milk L, containing an average of 3.302 per cent. of fat or a total of 49.539 pounds, yields 144.25 pounds of green cheese, being 2.9 pounds of cheese for each pound of fat. The same weight of milk H, containing an average of 3.919 per cent. of fat or a total of 58.73 pounds, yields 158 pounds of green cheese, being 2.6 pounds of cheese for each pound of fat. Under exactly similar conditions of handling, the rich milk yields $13\frac{3}{4}$ pounds more cheese than the poor milk, but the poor milk makes $\frac{3}{10}$ of one pound of cheese more for every pound of fat than does the rich milk.

Suppose L and H to represent two patrons, each supplying 1,500 pounds of milk. L's milk yields 144.25 pounds of cheese and H's milk 158. Then, if the cheese nets 9 cents, patron L should receive 144.25 × 9 or $12.98 ; and H, 158 × 9 or $14 22. Had these patrons been paid according to weight of milk alone, each would have received equal shares. In all, 302.25 pounds of cheese were made, netting 9 cents a pound, 302.25 × 9 = $27.20 would be divided equally, each patron receiving $13.60. Accordingly, patron L, supplying the poor milk, would be paid 62 cents too much, and patron H 62 cents too little.

Second Period.

The principal points being investigated in the chemical analyses of milk, cheese and whey, now in progress at this College, the plan of securing samples for analyses, and the results obtained during May and June, are given on page 20. During those two months, particularly May, there was plenty of rain, and pasture was abundant.

The average percentage of fat of the samples of milk (five in number) testing 3.6 and over, was 3.915, or practically 4. It took an average of 9.4 lb. of this milk to make one pound of cheese; the milk contained an average of one pound of fat to .60 lb. of casein, and it yielded 2.6 lb. of cheese per one pound of fat. The average percentage of fat of the samples (five in number) testing under 3.6, was 3.302. It took 10.3 lb. of this milk to make one pound of cheese. The milk contained one pound of fat to .67 lb. of casein; and it yielded 2.9 lb. of cheese per one pound of fat. That is to say, the milk high in fat made more cheese per pound of milk, contained less casein per pound of fat, and yielded less cheese per pound of fat than the milk low in fat. The investigations outlined on page 20 are being continued along exactly the same lines.

Herewith are given, in comparison with those already published, the results for July and August. During this experimental period the weather was unusually dry; and the pasture was less abundant than during May and June. The average of all full duplicate determinations shows that the milk of May and June contained .059 per cent. less fat and .019 per cent. more casein than the milk of July and August.

The table below gives the composition of the milk and that of the cheese and whey obtained from it, on four different dates for lot L, or milk low in fat, and lot H, or milk high in fat. The figures showing the composition of the milk of any particular date and vat, and those of the cheese and whey made from that milk occur on the same line of averages. In lot H the milk of Aug. 2nd and July 31st was the richest in fat, containing a little over 4 per cent. The percentage of fat in the cheese of these dates is about one higher than that in the cheese of July 5th, made from milk containing 3.819 per cent. of fat, and about 3.5 higher than that in the cheese of July 7th, made from milk containing 3.489 per cent. of fat. In lot L, with slight exceptions, a similar relation is evident, *i.e.*, cheese relatively rich in fat comes from milk relatively rich in fat, while cheese relatively low in fat comes from milk relatively low in fat. It can also be said of the whey that the percentage of fat is relatively high or low as the percentage of fat in the milk from which it was made was relatively high or low. The relation in the fat of the milk, the cheese and the whey observed above, was not so evident in the May and June analyses. The fat of the milk being held mechanically in the curd, and tending to separate from it and to rise to the surface, variations in conditions attending coagulation, milling, etc. would materially influence the amount of fat retained by the curd. If exactly similar conditions in every detail could be secured, the fat in the whey would probably vary fairly regularly with the quantity of fat in the milk. In lot H, with one exception, the yield of cheese is in the order of (though not necessarily proportional to) the percentages of fat—the richest milk yielding the greatest quantity of cheese. The exception is in the low yield of cheese on July 31st. It may be accounted for, however, by the gassy condition of the curd of that date, resulting probably, as analysis showed, in a drier and consequently lighter cheese. In lot L, upon the same date, a similar deficiency in yield of cheese occurs. The curd of this cheese was also gassy; and analysis showed a relatively dry cheese. The percentages of fat in the other three samples of milk, and also their yields of cheese are very close. In lot H the average percentage of fat in the milk was 3.849; and it took 9.7 lb. of this milk to make one pound of cheese. In lot L the average percentage of fat in the milk was 3.153; and it took 11.18 lb. of milk to make one pound of cheese. That is, a given weight of rich milk makes more cheese than an equal weight of poor milk.

Composition of Milk, Cheese and Whey.—Second Period.

Lot H.	Per cent. of water. Milk.	Per cent. of water. Cheese.	Per cent. of water. Whey.	Per cent. of solids. Milk.	Per cent. of solids. Cheese.	Per cent. of solids. Whey.	Per cent. of fat. Milk.	Per cent. of fat. Cheese.	Per cent. of fat. Whey.	Per cent. of casein. Milk.	Per cent. of casein. Cheese.	Per cent. of albumen. Milk.	Per cent. of albumen. Cheese.	Per cent. of albumen. Whey.	Pounds of green cheese from 100 lb. milk.
July 5th I	87.495	34.885	92.936	12.505	65.115	7.064	3.850	35.522	.249	2.518	23.587	....	1.250	1.012	
II	87.289	34.679	93.004	12.711	65.321	6.996	3.789	36.050	.211	2.500	23.306	....	1.594	.981	
Average	87.392	34.782	92.970	12.608	65.218	7.030	3.819	35.786	.230	2.509	23.446	.744	1.422	.996	10.41
July 7th I	87.546	34.358	93.393	12.454	65.642	6.607	3.483	33.293	.254	2.300	23.425	1.112	2.543	1.062	
II	87.464	34.665	93.424	12.536	65 335	6.576	3.495	32.594	.236	2.175	22.568	1.237	3.088	1.012	
Average	87.505	34.511	93.408	12.495	65.489	6.591	3.489	32.943	.245	2.237	22.996	1.175	2.816	1.037	10.25
July 31st I	87.285	32.691	93.036	12.715	67.309	6.964	4.065	36.386	.341	2.356	23.362	.844	1.781	1.062	
II	87.306	32.018	93.111	12.694	67.982	6.889	3.967	36.867	.297	2.468	23.400	.744	1.975	.993	
Average	87.295	32.354	93.073	12.704	67.646	6.926	4.016	36.626	.319	2.412	23.381	.794	1.878	1.027	9.82
August 2nd I	86.989	34.293	93.050	13.011	65.707	6.950	4.092	36.268	.346	2.193	21.837	1.119	.900	1.000	
II	86.995	34.217	93.036	13.005	65.783	6.964	4.058	36.525	.320	2.181	21.381	1.156	1.719	.972	
Average	86.992	34.255	93.043	13.008	65.745	6.957	4.075	36.396	.333	2.187	21.609	1.137	1.309	.986	10.50
Average of all..............	87.296	33.975	93.123	12.703	66.057	6.872	3.849	35.438	.281	2.336	22.858	.986	1.856	1.011	10.24
Lot L.															
July 5th I	88.208	34.755	92.887	11.792	65.245	7.113	3.126	33.802	.276	2.287	24.381	.914	1.850	.875	
II	88.255	34.969	92.572	11.745	65.031	7.428	3.154	33.174	.276	2.600	25.075	.681	1.200	.956	
Average	88.231	34 862	92.729	11.768	65.138	7.271	3.140	33.488	.276	2.443	24.728	.812	1.525	.915	.941
July 7th I	88.022	35.802	93.677	11.978	64.198	6.323	2.941	31.637	.190	1.918	23.137	....	......	.887	
II	88.310	35.829	93.601	11.690	64.171	6.399	2.994	31.642	.233	1.975	22.412	....	......	.943	
Average	88.166	35.815	93.639	11.834	64.185	6.361	2.967	31.640	.211	1.946	22.774	1.110	3.601	.915	9.00
July 31st I	87.803	34.148	93.302	12.197	65.852	6.698	3.328	33.885	.277	2.037	22.950	.956	1.743	1.012	
II	87.912	33.591	93.172	12.088	66.409	6.828	3.289	33.851	.285	2.012	22.493	1.019	2.257	.918	
Average	87.857	33.869	93.237	12.142	66.131	6.763	3.308	33.868	.281	2.024	22.721	.988	2.000	.965	8 83
August 2nd......... ... I	88.191	35.410	93 361	11.809	64.590	6.639	3.294	33.974	.287	2.037	22.968	1.113	1.607	.887	
II	88.294	35.342	93.286	11.706	64.658	6.714	3.101	33.903	.279	1.918	22.725	1.138	1.712	.981	
Average	88.242	35.376	93.323	11.757	64.624	6.676	3.197	33.938	.283	1.977	22.846	1.126	1.660	.934	9.16
Average of all......	88.124	34.980	93.232	11.875	65.019	6.767	3.153	33.233	.262	2.097	23.267	1.009	2.196	.932	9.00

Table showing pounds of fat in cheese and whey from 300 pounds of milk.

—	Date	Pounds of milk.	Per cent. of fat in milk.	Per cent. of casein.	Ratio of fat to casein.	Pounds of fat in 300 lb. of milk.	Pounds of cheese in 300 lb. of milk.	Ratio of fat to green cheese.	Pounds of fat in whey from 300 lb. of milk.	Pounds of fat in yield of cheese. By direct determination.	Pounds of fat in yield of cheese. By difference.
Lot L.	July 7th	300	2.967	1.946	1 : 0.65	8.823	27.00	1 : 3.06	.576	8.542	8.247
	July 5th	300	3.140	2.413	1 : 0.77	9.420	28.25	1 : 2.99	.749	9.460	8.671
	August 2nd	300	3.197	1.977	1 : 0.61	9.591	27.50	1 : 2.86	.771	9.332	8.820
	July 31st	300	3.307	2.024	1 . 0.62	9.921	26.51	1 : 2.67	.768	8.975	9.153
	Total	1,200	3.153	2 098	1 : 0 66	37.755	109.26	1 : 2.89	2.864	36.309	34.891
Lot H.	July 7th	300	3.489	2.237	1 : 0 64	10.467	30.75	1 : 2.93	.659	10.129	9.808
	July 5th	300	3.819	2.509	1 : 0 65	11.457	31.25	1 : 2.72	.618	11.223	10.839
	July 31st	300	4.016	2.412	1 : 0.60	12.048	29 50	1 : 2.44	.862	9.804	11.186
	August 2nd	300	4 075	2.187	1 : 0 53	12.225	31.50	1 : 2.57	.895	11.464	11.330
	Total	1,200	3.849	2.336	1 : 0 60	46.197	123.00	1 : 2.66	3.034	42.620	43.165

On July 31st 300 lb. of milk, lot L. containing 9.921 lb. of fat, yielded less cheese than the same weight of milk, lot L, July 7th, containing 8.823 lb. of fat. Why less cheese from the richer milk? The table of composition shows that the milk of July 31st was the highest in fat and second to the highest in casein of all other samples in lot L. The same table shows that the milk of July 7th was the lowest in fat and in casein of all the samples in lot L. Basing the yield of cheese only upon the composition of the milk, a greater quantity of cheese would be expected from the milk of July 31st than from the milk of July 7th. More actual water-free cheese was obtained from the former milk; but analysis proved that the cheese of the 7th was the wettest and that of the 31st the driest in lot L. This difference in the quantity of moisture retained in the cheese is sufficient in itself to account for the lighter cheese from the richer milk. The above table also shows in lot L more cheese on July 5th than on Aug. 2nd. This is another instance of the poorer milk yielding the greater quantity of cheese. The poorer milk contained only .171 lb. less fat, but 1.398 lb. more casein than the richer milk. The cheese produced from these two samples of milk contained practically equal weights of water The whey produced also contained practically equal weights of casein and of fat. It would, therefore, appear to be the excess of casein in the poorer sample of milk that enabled this milk to yield a greater quantity of cheese. The analysis reveals a difference in the amount of casein in the cheese of these dates, which is exactly equal to the difference in the casein of the milk of the same dates. This fact is consistent with the above opinion, viz., that the greater weight of cheese from the milk lower in fat was owing to its greater quantity of casein.

In lot H, the lowest yield of cheese occurred on July 31st, and the highest yield on August 2nd. The milk of the 2nd contained only .177 lb. more fat and .675 lb. less casein than the milk of the 31st. but the cheese of August 2nd was two pounds heavier than the cheese of July 31st. Why should there be this difference in the quantities of cheese from equal weights of milk, varying in fat by only .059 per cent.? Three facts in explanation are brought out by analysis, viz, the excess of fat in the milk of the 2nd was not lost in the whey, but was retained in the cheese; the excess of casein in the milk of the 31st was partly lost in the whey; and the cheese of the 31st contained 1.25 lb. less moisture than the cheese of the 2nd. The curd of the 31st was gassy. That of the 2nd was normal. This is another example of gassy curd yielding dry, light cheese.

The milk of July 5th contained, on the whole, .99 lb. more fat, and .816 more casein than the milk of July 7th. Both samples produced normal curd. The analysis of the cheese and whey of these dates showed that the excess of fat and part of the excess of casein in the milk of the 5th were not lost in the whey, but remained in the cheese. A greater yield of cheese, therefore, might be expected on the 5th, and this was the case. As only part of the increased weight in the cheese of the 5th was due to water, the excess of fat and of casein in the milk of the 5th must have contributed to the increase in the weight of the cheese of the 5th.

The average percentage of fat and casein in the milk of July 5th, 7th, 31st and August 2nd, in lots L and H, are arranged, in the above table, in the order of the percentage of fat. The figures, under ratio of fat to casein, show considerable irregularities in the amount of casein per pound of fat. For example, in the richest milk, containing 4.075 per cent. of fat, there is .53 lb. of casein to one pound of fat; while in the milk poorest in fat, containing only 2.967 per cent., there is .65 lb. of casein to one pound of fat. Yet the richest samples do not necessarily contain the lowest amount of casein per pound of fat. For instance, in lot H, the casein in the first and second samples is represented by .61 and .65 respectively, and in lot L, in the third and fourth samples, by .61 and .62 respectively. Notwithstanding these individual irregularities, the average percentage of casein is 2.098 in lot L, and 2,336 in lot H; and the average quantity of casein per pound of fat is .66 lb. in lot L, and .60 lb. in lot H. These figures indicate the tendency of milk rich in fat to be also rich in casein; but that the relative increase in the casein is less than that in the fat.

Lots L and H, the former being milk low in fat and the latter being milk high in fat, represent equal quantities of milk, each being 1,200 lb. The above table shows that the 1,200 lb. of rich milk contained 8.442 lb. more fat and made 13.74 lb. more cheese than the 1,200 lb. of poor milk. But the two richest samples of milk yielded the least, and the two poorest samples the greatest quantities of cheese per pound of fat in the milk. The figures in the column under "Ratio of fat to cheese" clearly indicate a decrease in the proportion of cheese to fat in milk as the samples of milk increase in richness.

Third Period.

The following is a report of the analyses made during September, October and November, together with a summary of all former results. The data along each of the lines of investigation, viz (1) the fat in relation to the casein in milk; (2) the fat of the milk in relation to the yield of cheese; (3) the quantity of the fat of the milk lost in the whey; (4) the fat of the milk as a basis in apportioning dividends to patrons, and (5) the composition of milk, cheese and whey are strikingly concordant in the three periods into which the experimental season is divided.

In all, one hundred and eighty complete analyses, representing thirty distinct samples each of milk, cheese and whey have been made. No variations in methods from those outlined in the first period have been made. But the milk purchased to supplement that from our own herd, as explained above, was not procured from the same parties throughout the experimental season. This circumstance lessens the value of the figures giving general averages in composition.

By comparing the figures in this table showing average of all with similar figures, first, for May and June, and secondly, for July and August, it will be seen that there is practically no difference in the composition of the respective products in these three periods. But by comparing these same figures of lot L with lot H in the above table, and in the other two periods above referred to, at least two products, milk and cheese, contain higher percentages of water in lot L than in lot H, higher percentages of fat in lot H than in lot L, a slightly higher percentage of casein in the milk of lot H than in the milk of lot L, and, in two of the periods, a higher percentage of casein in the cheese of lot L than in the cheese of lot H. These facts show that the composition of the cheese varies nearly as the composition of the milk from which it is made.

COMPOSITION OF MILK, CHEESE AND WHEY.—THIRD PERIOD.

	Per cent. of water.			Per cent. of solids.			Per cent. of fat.			Per cent. of casein.			Per cent. of albumen.			Pounds of green cheese from 100 lb. milk.
	Milk.	Cheese.	Whey.	Milk.	Cheese.	Whey.	Milk.	Cheese.	Whey.	Milk.	Cheese.	Whey.	Milk.	Cheese.	Whey.	
LOT H.												T. N.				
September 4th ... I	87.340	35.593	93.146	12.660	64.407	6.854	3.885	34.792	.409	2.250	21.481	1.206	.925	......	......	......
September 4th ... II	87.388	35.751	93.073	12.612	64.249	6.927	3.889	34.812	.408	2.318	22.231	1.243	.969	......	......	......
Average..........	87.364	35.672	93.108	12.636	64.328	6.890	2.887	34.802	.408	2.284	21.856	1.224	.947	1.731	......	10.41
September 6th.... I	87.521	35.392	93.281	12.479	64.608	6.719	3.849	35.664	.280	2.143	21.543	.950	.950	1.387	......	......
September 6th.... II	87.577	35.330	92.894	12.423	64.670	7.106	3.821	35.221	.294	2.237	21.206	.925	.938	1.850	......	......
Average..........	87.549	35.361	93.087	12.451	64.639	6.912	3.835	35.442	.287	2.190	21.374	.937	.944	1.618	......	10.41
October 2nd...... I	87.147	34.500	93.114	12.853	65.500	6.886	4.119	35.385	.285	2.212	22.206	1.050	1.050	.744	......	......
October 2nd...... II	87.204	34.652	93.125	12.796	65.348	6.875	4.034	35.155	.274	2.356	21.866	.993	.919	1.002	......	......
Average..........	87.175	34.576	93.119	12.824	65.424	6.880	4.076	35.270	.279	2.284	22.036	1.021	.984	.873	......	10.83
October 4th I	87.708	34.785	93.262	11.292	65.215	6.738	3.695	34.936	.302	2.231	21.593	.968	.894	1.494	......	......
October 4th II	87.781	34.985	93.357	12.219	65.015	6.643	3.689	35.194	.268	2.262	22.250	.962	.944	1.125	......	......
Average..........	87.744	34.885	93.309	12.255	65.115	6.690	3.692	35.055	.285	2.246	21.921	.965	.919	1.309	......	10.41
November 6th.... I	86.898	34.332	92.908	13.102	65.668	7.092	4.019	35.020	.220	2.417	21.175	.918	.851	1.181	......	......
November 6th.... II	86.989	33.918	92.930	13.011	66.082	7.070	3.980	34.879	.211	2.487	21.150	.956	.825	.862	......	......
Average	86.943	34.125	92.919	13.056	65.875	7.081	3.999	34.949	.215	2.452	21.162	.937	.838	1.071	......	10.75
November 8th.... I	87.207	33.918	93.091	12.793	66.082	6.909	3.925	35.065	.198	2.375	22.950	.787	.675	.587	......	......
November 8th.... II	87.211	34.009	93.157	12.789	65.991	6.843	3.931	34.866	.208	2.418	22.675	.818	.675	.737	......	......
Average	87.209	33.963	93.124	12.791	66.037	6.876	3.928	34.965	.203	2.396	22.812	.802	.675	.662	......	10.41
Average of all	87.331	34.763	93.111	12.669	65.231	6.888	3.903	35.082	.279	2.309	21.804	.981	.884	1.139	......	10.53
LOT L.												T. N.				
September 4th.... I	88.454	36.131	93.435	11.546	63.869	6.565	3.138	32.914	.253	2.018	22.962	.993	.850	1.450	......	......
September 4th.... II	88.561	36.041	93.387	11.429	63.949	6.613	3.126	33.151	.245	2.087	22.850	.912	.775	1.400	......	......
Average..........	88.507	36.086	93.411	11.487	63.914	6.589	3.132	33.032	.249	2.052	22.906	.952	.813	1.425	......	9.00
September 6th.... I	88.521	36.092	93.412	11.479	63.908	6.588	2.943	32.118	.231	2.218	23.375	.918	......	1.693	......	......
September 6th.... II	88.584	36.181	93.384	11.416	63.819	6.616	2.908	32.375	.194	2.043	23.056	.915	......	1.819	......	......
Average	88.552	36.136	93.398	11.447	63.864	6.602	2.925	32.246	.212	2.130	23.243	.916	.682	1.756	......	8.91
October 2nd...... I	87.757	36.191	93.111	12.243	63.809	6.889	3.547	33.604	.226	2.300	22.587	.987	.937	.375	......	......
October 2nd...... II	87.925	35.885	93.143	12.075	64.115	6.857	3.478	33.526	.227	2.181	22.172	1.106	1.049	.784	......	......
Average..........	87.841	36.038	93.127	12.159	63.962	6.873	3.512	33.565	.226	2.240	22.379	.996	1.003	.679	......	10.16
October 4th I	88.090	35.909	93.290	11.910	64.091	6.710	3.353	34.218	.243	2.281	22.662	.956	.912	.788	......	......
October 4th II	88.029	36.014	93.264	11.971	63.986	6.736	3.373	34.007	.238	2.268	21.925	.968	1.013	1.575	......	......
Average.........	88.059	35.961	93.277	11.940	64.039	6.723	3.363	34.112	.240	2.274	22.293	.962	.962	1.181	......	9.91
November 6th I	87.755	34.924	93.059	12.245	65.076	6.941	3.458	33.884	.233	2.450	22.531	.862	.725	.727	......	......
November 6th II	87.609	34.663	93.100	12.391	65.337	6.900	3.306	33.752	.234	2.368	22.843	.912	.807	.950	......	......
Average..........	87.682	34.793	93.079	12.318	65.207	6.920	3.382	33.818	.233	2.409	22.687	.887	.766	.838	......	9.94
November 8th.... I	88.007	34.767	93.171	11.993	65.233	6.829	3.379	34.043	.267	2.293	23.125	.831	.656	......	......	......
November 8th.... II	87.949	34.997	93.286	12.051	65.003	6.714	3.477	33.942	.196	2.275	23.093	.800	.582	......	......	......
Average....	87.978	34.882	93.228	12.022	65.118	6.771	3.428	33.992	.231	2.284	23.109	.815	.619	1.003	......	9.41
Average of all	88.103	35.649	93.253	11.896	64.349	6.746	3.290	33.461	.232	2.232	22.764	.921	.822	1.153	....	9.55

To produce one lb. of cheese, it takes on an average one lb. more of the milk containing 3 290 percentage of fat than of milk containing 3.903. By referring back to the results of May and June and of July and August, it will be seen that to produce one pound of cheese it took, in the former period, .9 of one pound more of milk containing 3.302 percentage of fat than of milk containing 3.915, and, in the latter period, 1.47 lb. more of milk containing 3.153 percentage of fat than of milk containing 3.849. The average percentage of fat in milk L of the 30 fat determinations made during the season, is 8 248. This milk yielded one lb. of cheese per 10.64 lb. of milk. While the average percentage of fat in milk H of the 30 fat determinations made during the season, is 3 889. This milk yielded one pound of cheese per 9.5 lb. of milk. The figures show that it took practically one pound more of the poorer than it did of the richer milk to make one pound of cheese.

Table showing Average Composition of Milk, Cheese and Whey.

—	Water.	Total solids.	Fat.	Casein.	Albumen.	Sugar, etc.
Milk.						
Average of 18 duplicate determinations of 9 samples, May and June	87.687	12.318	3.546	2.279	0.704	5.789
Average of 10 duplicate determinations of 5 samples, July and August	87.576	12.423	3.605	2.260	0.981	5.575
Average of 22 duplicate determinations of 11 samples, September, October and November	87.641	12.358	3.657	2.283	0.861	5.550
Average of all	87.634	12.366	3.602	2 274	0.848	5.638
Average for 1893 at 48 American factories	87.280	12.72	3 77	2.48	0.69	5.78
Whey.						
Average of 12 duplicate determinations of 6 samples, May and June	93.435	6.564	0.239	0.130	0.759	5.436
Average of 18 duplicate determinations of 9 samples, July and August	93.168	6.831	0.268	0.954		5.590
Average of 24 duplicate determinations of 12 samples, September, October and November	93.182	6.817	0.255	0 951		5.612
Average of all	93.261	6.737	0.254	0.931		5.546
Average for 1893 at 48 American factories	93.000	7.000	0.38	0.86		5.76
Green cheese.						
Average of 10 duplicate determinations of 5 samples, May and June	34.601	65.399	35.511	22.103	1.082	6.703
Average of 14 duplicate determinations of 7 samples, July and August	34.287	65.713	34.720	23.103	1.801	6.086
Average of 20 duplicate determinations of 10 samples, September, October and November	35.192	64 807	34.246	22.278	1.141	7.143
Average of all	34.693	65.306	34.825	22.494	1.341	6.644
Average for 1893 at 48 American factories	36.84	63.16	33 90	23.32		5.94

This table gives the average composition of milk, whey and cheese calculated from the full duplicate analyses for each period of the experimental season, viz., May and June, July and August, and September, October and November. Any duplicate analysis in which one or more constituents were not determined, has been rejected in compiling this table. It will be seen that there is very little variation in the figures giving the composition of milk in the above three periods, and practically none in the case of whey. There are variations in the figures for cheese in the above periods. But these are due probably to the difficulty of sampling cheese for analysis. For milk the average of all is taken from 50 duplicate analyses of 25 distinct samples ; that for whey is taken from 54 duplicate analyses of 27 distinct samples ; and that for cheese is taken from 44 duplicate analyses of 22 distinct cheese.

Table Showing Pounds of Fat in Cheese and Whey from 300 Pounds Milk.

	Date.	Pounds of milk.	Per cent. of fat in milk.	Pounds of fat in 300 pounds of milk.	Pounds of cheese from 300 pounds of milk.	Pounds of fat in yield of whey.	Pounds of fat in yield of cheese. By direct determination.	Pounds of fat in yield of cheese. By difference.
L.	September 6th	300	2.925	8.775	26.75	.579	8.625	8.196
	September 4th	300	3.132	9.396	27.00	.679	8.918	8.717
	October 4th	300	3.363	10.089	29.75	.648	10.148	9.441
	November 6th	300	3.382	10.146	29.75	.629	10.060	9.517
	November 8th	300	3.428	10.286	28.25	.627	9.602	9.659
	October 2nd	300	3.512	10.536	30.50	.609	10.237	9.927
H.	October 4th	300	3.692	11.076	31.25	.765	10.957	10.311
	September 6th	300	3.835	11.505	31.25	.771	11.075	10.834
	September 4th	300	3.887	11.661	31.25	1.096	10.875	10.565
	November 8th	300	3.928	11.784	31.25	.547	10.926	11.237
	November 6th	300	3.999	11.997	32.25	.575	11.271	11.422
	October 2nd	300	4.076	12.228	32.50	.746	11.462	11.482

Although there is considerable difference in the amount of fat contained in 300 pounds of milk of different dates, there is very little difference in the amount of fat in the whey of different dates. The figures in the last column, under fat in cheese by difference, show that, in rich milk, a greater quantity of fat becomes entangled in the curd, and thus found in the cheese than in poor milk.

Table showing ratio of fat to casein, and relation of fat in milk to yield of cheese.

	Per cent. of fat.	Per cent. of casein.	Ratio of fat to casein.	Pounds of fat in 300 pounds milk.	Pounds of green cheese from 300 pounds milk.	Ratio of fat to green cheese.
L. Samples of milk	2.925	2.130	1 : 0.72	8.775	26.75	1 : 3.03
	3.132	2.052	1 : 0.65	9.396	27.00	1 : 2.87
	3.363	2.274	1 : 0.67	10.089	29.75	1 : 2.94
	3.382	2.409	1 : 0.71	10.146	29.75	1 : 2.93
	3.428	2.284	1 : 0.66	10.286	28.25	1 : 2.74
	3.512	2.240	1 : 0.63	10.536	30.50	1 : 2.89
L. Average for Sept., Oct. and Nov.	3.290	2.231	1 : 0.67	59.228	172.00	1 : 2.90
Average for May and June	3.302	2.223	1 : 0.67	49.539	144.25	1 : 2.90
Average for July and August	3.153	2.098	1 : 0.66	37.755	109.26	1 : 2.89
Average for all	3.248	2.184	1 : 0.66	....	....	1 : 2.89
H. Samples of milk	3.692	2.246	1 : 0.60	11.076	31.25	1 : 2.82
	3.835	2.190	1 : 0.57	11.505	31.25	1 : 2.71
	3.887	2.284	1 : 0.58	11.661	31.25	1 : 2.69
	3.928	2.396	1 : 0.61	11.784	31.25	1 : 2.56
	3.999	2.452	1 : 0.61	11.997	31.25	1 : 2.70
	4.076	2.284	1 : 0.56	12.228	32.50	1 : 2.65
H. Average for Sept., Oct. and Nov.	3.902	2.309	1 : 0.59	70.251	189.75	1 : 2.70
Average for May and June	3.919	2.366	1 : 0.60	58.731	158.00	1 : 2.60
Average for July and August	3.849	2.336	1 : 0.60	46.197	123.00	1 : 2.66
Average for all	3.890	2.337	1 : 0 59	....	....	1 . 2.65

The above table, showing ratio of fat to casein, contains six duplicate analyses of the percentages of fat and of casein in lots L and H of September, October and November. It gives averages of percentages of fat and of casein for the three periods of the experimental work, viz.: May and June, July and August, and September, October and November. It also reports separately the season's averages of fat and of casein in lots L and H. The figures in the third column show the decimal of a pound of casein to one pound of fat in the milk. The L average for all represents duplicate analyses of 15 distinct samples, or 30 single determinations; and the H average for all represents duplicate analyses of 14 distinct samples, or 28 single determinations. The figures giving percentages of casein do not show a regular proportional increase with the increase in the percentage of fat. The most that can be said as to the increase of casein, is, that a number of rich samples of milk give a slightly higher percentage of casein than a number of poor samples. This is shown by the averages in the table. But there are instances, in the above table, or poor milk being comparatively high in casein, and vice versa. Similar instances occur all through the season's tests. While a number of samples of milk averaging high in fat tend, as above stated, to average slightly higher in casein, the increase in the casein is apparently quite independent of the increase in the percentage of fat. That the casein does not increase proportionately as the fat, is shown clearly by the figures in the third column under ratio of fat to casein. As a result of dividing continuously increasing percentages of fat into nearly constant percentages of casein, the ratio must widen as the percentages of fat increase.

Since the fat and the casein of milk go to form fully 55 per cent. of the weight of its cheese, and since the fat of milk varies considerably, but casein slightly, it follows that equal quantities of milk of increasing percentages of fat yield under normal conditions increasing quantities of cheese, but that the yield of cheese per pound of fat gradually decreases. Consequently fat alone cannot accurately determine the cheese-producing power of milk. The above table shows that L samples, averaging for the whole season 3.248 percentage of fat, yield 2.89 pounds of cheese per pound of fat; while H samples, averaging for the whole season 3.890 percentage of fat, yield only 2.65 pounds of cheese per pound of fat.

But while fat alone does not accurately determine the cheese-producing power of milk, it is preferable, as a basis for apportioning dividends, to the common methods, i. e., according to weight of milk. A careful study of the results of our season's tests from the important standpoint of apportioning dividends, leads me to believe that for milks varying in fat from three to four per cent. a number, representing the average percentage of casein in such milks, might be added to each fat reading; that this sum of fat and casein would be a much fairer basis than that of fat alone for distributing dividends to patrons.

In the table below, fifteen average determinations of fat and casein of distinct vats of milk, both in milk high and in milk low in fat, are arranged in periods, in order to show the ratio, (1) of fat to yield of cheese, and (2) of fat plus casein to yield of cheese. For each period, are given the total pounds of milk, the total pounds of fat plus casein, the average percentages of fat and casein, and the average ratio of fat to cheese, and of fat plus casein to cheese. In every period, the average ratio of fat to yield of cheese is wider for milk low in fat than for milk high in fat. The season's average gives .24, or practically one-quarter pound more cheese per pound of fat in L than in H milk; while the average ratios of fat plus casein to yield of cheese in milk low in fat, and in milk high in fat, are practically the same for corresponding periods; and the season's average gives identically the same yield of cheese per pound of fat plus casein with L milk, averaging 3.248 of fat, as with H milk averaging 3.890 of fat.

	Date.	Pounds of milk supplied.	Percentage of fat in milk.	Percentage of casein in milk.	Sum of fat plus casein.	Ratio of fat to yield of green cheese.	Ratio of the sum of the fat and casein to the yield of green cheese.
	Lot L.						
Period 1	June 4th	300	3.080	2.216	16.062	1 : 3 0	1 : 1.70
	May 7th	300	3 193	2.420	16.401	1 : 2.8	1 : 1.67
	June 6th	300	3.194	2 046	16.404	1 : 3.1	1 : 1.80
	May 2nd	300	3.482	2.106	17.268	1 : 2.6	1 : 1.60
	June 8th	300	3.564	2.327	17.514	1 : 2.8	1 : 1.77
	Total	1,500	3.302	2.223	83.649	1 : 2 9	1 : 1.70
Period 2	July 7th	300	2.967	1.946	15.645	1 : 3.06	1 : 1.72
	" 5th	300	3.140	2.443	16.242	1 : 2.99	1 : 1.73
	August 2nd	300	3 197	1.977	16 413	1 : 2.86	1 : 1.67
	July 31st	300	3.307	2.024	16.743	1 : 2.67	1 : 1.58
	Total	1,200	3.153	2.098	65.043	1 : 2.89	1 : 1.67
Period 3	Sept. 6th	300	2.925	2.130	15.597	1 : 3 03	1 : 1.71
	" 4th	300	3.132	2 052	16.218	1 : 2.87	1 : 1 66
	Oct. 4th	300	3 363	2.274	16 901	1 : 2 94	1 : 1.76
	Nov. 6th	300	3.382	2.409	16.968	1 : 2 93	1 : 1.75
	" 8th	300	3.428	2.284	17.108	1 : 2 74	1 : 1.65
	Oct. 2nd	300	3.512	2.240	17.358	1 : 2.89	1 : 1.75
	Total	1,800	3.290	2.231	100.150	1 : 2.90	1 : 1.71
	Whole season	4,500	3.248	2.184	248 842	1 : 2 89	1 : 1.69
	Lot H.						
Period 1	June 6th	300	3.655	2.368	17.787	1 : 2.9	1 : 1.84
	May 7th	300	3.685	2.255	17 877	1 . 2.6	1 : 1.63
	" 2nd	300	3.899	2.181	18 519	1 : 2.5	1 : 1.60
	June 8th	300	4.000	2.396	18.822	1 : 2.7	1 : 1.72
	" 4th	300	4.338	2 445	19.836	1 : 2.5	1 : 1.70
	Total	1,500	3.915	2.329	92.841	1 : 2.6	1 : 1.69
Period 2	July 7th	300	3.489	2.237	17.289	1 : 2.93	1 : 1.77
	" 5th	300	3.819	2.509	18.279	1 : 2.72	1 : 1.70
	" 31st	300	4.016	2.412	18.870	1 : 2.44	1 : 1.56
	August 2nd	300	4.075	2.187	19.047	1 : 2.57	1 : 1.65
	Total	1,200	3.849	2.336	73.483	1 : 2 66	1 : 1.67
Period 3	Oct. 4th	300	3 692	2.246	17 898	1 : 2.82	1 : 1.74
	Sept. 6th	300	3.835	2.190	18 327	1 : 2.71	1 : 1.70
	" 4th	300	3.887	2 284	18 483	1 : 2.68	1 : 1.69
	Nov. 8th	300	3.928	2 396	18.606	1 : 2.56	1 : 1 67
	" 6th	300	3.999	2.452	18.819	1 : 2.70	1 : 1.71
	Oct. 2nd	300	4.076	2.284	19.050	1 : 2.65	1 : 1.70
	Total	1,800	3.902	2.309	111.183	1 : 2.70	1 : 1.70
	Whole season	4,500	3.890	2.324	277.507	1 : 2.65	1 : 1.69

The following table makes it clear, (1) that in paying according to weight of milk patron L, whose 1,500 pounds of milk tests 3.302 percentage of fat, receives 69 cents more than the relative value of his milk; while patron H. for the same weight of milk, testing 3 915 percentage of fat, receives 69 cents less than the relative value of his milk; (2) that in paying according to percentage of fat, the loss and gain upon the same milks are 59 cents, being just 10 cents better than the former method, but in this case it is the patron having the poorer milk who loses, and the patron having the richer milk who gains; and (3) that in paying according to percentage of fat plus casein, the discrepancy is reduced to an insignificant amount. Similar conditions are traceable in this table through the other two periods of the season's tests.

2.274 is the average percentage of casein calculated from fifty analyses of the above quantities of milk. It is this percentage of casein that was added to the percentages of fat in apportioning dividends upon the basis of fat, plus casein. This number is certainly applicable to milks averaging between 3.248 and 3.890 percentage of fat; it explains why two per cent. added to the fat reading gives a fairer basis for apportioning dividends than adding nothing, one per cent., or three per cent.; but it must not be accepted as final and applicable for very rich or very poor milk without further investigation.

Patron.	Pounds of milk supplied.	Pounds of cheese produced.	Patrons receive for milk supplied according to weight of cheese.	to weight of milk.		to percentage of fat.		to percentage of fat and casein.	
			Value.	Value.	gains.	Value.	Losses or gains.	Value.	Losses or gains.
			$ c.	$ c.	cts.	$ c.	cts.	$ c.	cts.
L in May and June	1,500	144.25	14 42	15 11	+69	13 83	−59	14 32	−10
H " " "	1,500	158.90	15 80	15 11	−69	16 39	+59	15 89	+ 9
L " July and August	1,200	109.26	10 92	11 61	+69	10 44	−48	10 90	− 2
H " " "	1,200	123.00	12 30	11 61	−69	12 78	+48	12 32	+ 2
L " Sept., Oct., and Nov......	1,800	172.00	17 20	18 08	+88	16 54	−66	17 15	− 5
H " " " "	1,800	189.75	18 97	18 08	−89	19 62	+65	19 03	+ 6

Conclusions Drawn From the Season's Tests.

1. Taking the average of several samples, a relatively larger yield of cheese is obtained from relatively richer milk, but the increased yield of cheese is proportionately less than the increased percentage of fat in the milk.

2. Under normal conditions of milk, curd, etc., the percentage of fat in cheese varies closely with that in the milk from which it is made.

3. Under normal conditions of milk, curd, etc., a slightly higher percentage of fat is found in whey from rich than from poor milk.

4. The development of a gassy curd decreases the yield of cheese from a given quantity of milk.

5. Casein in milk does not increase proportionately as the fat.

6. Milk poor in fat makes more cheese per pound of fat than milk richer in fat.

7. That the greatest degree of care must be exercised in handling milk from the time it is drawn from the cow until made into cheese, to secure a maximum yield of cheese.

8. While fat as a basis in distributing dividends, is fairer than the common method, a still fairer basis is the sum of the fat and the casein of the milk. This sum is obtained by adding an average percentage of casein to the fat reading.

ANALYSIS OF SOILS FROM LAKE TEMISCAMING DISTRICT.

Early in the spring, two samples of soil from the Lake Temiscaming district were procured for analysis, through the Government agent for that district. One sample, a humus, represents the surface soil ; the other, a clay, the soil underlying this humus. The extent of this new district is greater than is generally known. It contains about 1,000,000 acres of first-class farming land. This land is rolling, well watered, and timbered. Mr. Neven, who has surveyed the townships north of Lake Temiscaming, reports that out of five townships there would not be over one hundred acres of bad land. These remarks also may be applied to the land south, between the lake and the Montreal river, and excepting a rough belt of probably five miles just to the south of the river, to the land stretching beyond for seventy or eighty miles. The district possesses good timber of several varieties such as white pine, black and yellow birch, spruce and tamarac. There are also said to be some splendid flats of sugar maple. The atmosphere is not damp ; and consequently a low winter temperature is not felt as a corresponding temperature would be in a damp atmosphere. In winter, there is usually plenty, though not an excessive, amount of snow. The spring is not late, and the climate is well suited for agricultural purposes. The soil over the district is apparently very uniform, consisting of a surface soil of humus, eight or nine inches in depth, beneath which is a clay of excellent quality.

The following table gives the composition of these soils :

—	Clay.			Humus.		
	I.	II.	Average.	I.	II.	Average.
Moisture	1.700	1.710	1.705	7.568	7.595	7.581
Insoluble matter	74.660	74.880	74.770			
Organic "	3.650	3.690	3.670	....	....	15.453
Soluble silica	0.312	0.255	0.283			
Alumina ($Al_2 O_3$)	5.820	5.619	5.719			
Peroxide of iron ($Fe_2 O_3$)	4.000	4.000	4.000			
Phosphoric acid ($P_2 O_5$)	0.292	0.203	0.247			
Sulphuric acid ($S. O_3$)	0.192	0.213	0.202			
Br. ox. of Manganese ($Mn_3 O_4$)	0.583	0.544	0.563			
Lime (Ca. O.)	0.977	0.732	0.854			
Magnesia (Mg. O.)	2.180	1.850	2.010			
Potash (K_2 O.)	1.980	....	1.980			
Soda (Na_2 O.)	0.331	....	0.331			
Undetermined	....	....	3.666			
Total	....	....	100.00			
Nitrogen	....	....	0.160	....	....	0.492

The constituents of chief importance to be determined in a soil are phosphoric acid, nitrogen, and potash. A soil containing sufficient amounts of each of these constituents, and having right physical properties, is fertile. A soil is said to be rich in the above constituents when they are present in the following quantities : Nitrogen, 0.15 ; phosphoric acid, 0 20, and potash 1.0 per cent. Therefore, as to plant food in the above clay soil, it is abundant.

That plant food in soils may yield abundant crops, a soil must possess such physical properties as warmth, a proper degree of moisture, porosity, etc.

Solar heat, as the sun's rays, is the greatest source of heat of practical importance in relation to the production of crops. Dark colored soils absorb the most and radiate the fewest rays, properties enabling such soils to attain the highest temperature. The surface soil of humus covering the Lake Temiscaming district is of this character, a matter of very great importance to any agricultural district. This surface of humus, by tillage, will become mixed with the underlying clay and improve the clay's porosity. It is this property of porosity that gives to a soil the capacity to absorb and retain moisture. Clay soils naturally possess a high absorptive power for salts in solution. This absorptive property for potash, ammonia and phosphoric acid has been shown to be due to hydrated oxides of iron and aluminium, which constituents abound in the clay of this district. By the gradual mixing of this clay with the overlying humus, a soil of most excellent agricultural properties will be formed.

ANALYSIS OF FISH MANURE.

Mr. S. Oku, of Tokio, Japan, who paid our College a visit last January, left with us a sample of fish manure brought from Japan, expressing a desire to have it analyzed. It appears that large quantities of this manure are procurable in Japan ; and the authorities of that country are considering the question of its exportation as a manure.

It was found to contain the following percentage composition :

Moisture	8.120
Ash	10.220
Organic matter	81.656
Nitrogen	11.230
Phosphoric acid	0.906
Potash	0.234

This material is similar in composition to the whole herrings received from British Columbia in 1890. (See Annual Report of 1890.)

Prof. C. C. James, in the above report, has said : " It will thus be seen that a most excellent fertilizer can be produced from any one or all of the samples of fish refuse sent here for analysis by (*a*) extracting the fat or oil ; (*b*) removing the excess of moisture by drying ; (*c*) thoroughly pulverizing. The fertilizer thus produced would be rich in nitrogen and phosphoric acid, but would be deficient in potash. To make a complete fertilizer of it an addition of sulphate of potash might be made."

ANALYSIS OF VARIETIES OF TURNIPS, SWEDES AND MANGELS.

The following table gives the percentage of dry matter, and yield of dry matter in tons per acre, of the several varieties of turnips, Swedes, and mangels selected by the Agricultural Committee of the Ontario Agricultural and Experimental Union, as promising varieties to be tested over Ontario during the summer of 1894 :

Varieties.	Per cent. of dry matter.	Average weight of root.	Yield of roots per acre.	Dry matter per acre.
		lbs.	Tons.	Tons.
Turnips and Swedes :				
Jersey Navet (93)	10.182	1.757	20.40	1.51
Early American Red Top	7.112	1.522	18.01	1.28
Hartley's Bronze Top	9.825	.953	11.37	1.12
Carter's Prize Winner	6.896	.920	10.27	.71
Carter's Elephant (93)	10.182	.945	9.84	1.00
Mangels :				
Giant Yellow (intermediate)	10.04	2.47	30.88	3.10
Long Red Selected	10.70	2.51	30.08	3.218
Warden Prize Orange Globe	11.60	2.05	24.88	2.886
White Silesian	14.69	1.78	21.20	3.114
Mammoth Red (intermediate)	10.70	1.70	20.72	2.598

For information regarding the yields of these roots over Ontario, see the report of the Ontario Agricultural and Experimental Union appended to this annual report.

The dry matter of roots being almost wholly digestible, the yield of dry matter rather than the yield of fresh material, determines the relative merits of varieties from the standpoint of yield. Carter's Elephant, on account of the higher percentage of dry matter, though yielding nearly one-half ton per acre less fresh material than Carter's Prize Winner, produces actually one-quarter of a ton per acre more food. The White Silesian mangel, yielding 21.20 tons of fresh material, produces, because of its high percentage of dry matter, practically as much actual food as other varieties yielding as much as 30 tons of fresh material per acre. The time is fast coming when farmers, in selecting varieties of roots, will consider the percentage of dry matters as well as yield per acre.

EFFECTS OF THINNING ON THE COMPOSITION OF ROOTS.

Varieties.		In fresh material.							Calculated to water-free substance.					
		Water.	Ash.	Crude Protein.	Amides.	Nitrogen-free extract.	Crude fibre.	Crude fat.	Ash.	Crude Protein.	Amides.	Nitrogen-free extract.	Crude fibre.	Crude fat.
Mangels:														
Unthinned	1	....	.913	.167	.104	10.161	.800	.061	7.480	1.369	.852	83.252	6.554	.496
	2	....	.908	.168	.107	10.151	.811	.061	7.440	1.376	.876	83.171	6.645	.496
Average		87.795	.910	.167	.105	10.156	.805	.061	7.460	1.372	.864	83.211	6.599	.496
12 inches	1	.....	.849	.164	.105	8.574	.771	.060	·.068	1.435	.997	81.478	7.327	.573
	2	....	.848	.151	.093	8.577	.791	.063	8.059	1.559	.884	81.507	7.517	.601
Average		89.477	.848	.157	.099	8.575	.781	.062	8.063	1.497	.940	81.492	7.422	.587
20 inches	1	.....	.940	.150	.096	8.762	.755	.054	8.738	1.394	.892	81.454	7.019	.502
	2	.....	.915	.152	.096	8.771	.770	.053	8.506	1.413	.892	81.537	7.158	.493
Average		89.243	.927	.151	.096	8.766	.762	.053	8.622	1.403	.892	81.495	7.088	.497
Swedes:														
Unthinned	1	.....	.596	.185	.078	10.063	1.123	.166	4.881	1.515	.639	82.409	9.196	1.359
	2	......	.609	.180	.072	10.062	1.122	.166	4.987	1.474	.590	82.401	9.190	1.359
Average		87.789	.602	.182	.075	10.062	1.122	.166	4.934	1.494	.614	82.405	9.193	1.359
12 inches	1	.....	.575	.197	.082	9.280	1.007	.179	5.080	1.740	.724	81.980	8.895	1.581
	2	......	.572	.206	.099	9.248	1.026	.169	5.053	1.819	.874	81.696	9.063	1.484
Average		88.680	.573	.201	.090	9.264	1.016	.174	5.066	1.779	.799	81.838	8.979	1.532
20 inches	1	....	.533	.166	.067	8.482	1.187	.169	5.026	1.565	.631	79.989	11.193	1.593
	2	.....	.541	.172	.076	8.602	1.039	.174	5.102	1.622	.716	81.120	9.798	1.640
Average		89.396	.537	.169	.071	8,542	1.113	.171	5.064	1.593	.673	80.554	10.495	1.616
Turnips:														
Unthinned	1	91.577	.818	.800	.338	5.292	1.072	.103	9.711	9.497	4.012	62.828	12.727	1.222
	2	.....	.844	.706	.250	5.497	1.025	.101	10.020	8.382	2.968	65.262	12.169	1.199
Average		......	.831	.753	.294	5.394	1.048	.102	9.865	8.939	3.490	64.045	12.448	1.210
12 inches	1	95.674	.623	.762	.444	1.712	.733	.052	14.401	17.614	10.263	39.575	16.944	1.202
	2	......	.621	.762	.443	1.590	.754	.056	14.355	17.614	10.240	36.754	17.430	1.294
Average		......	.622	.762	.444	1.651	.743	.054	14.378	17.614	10.251	38.164	17.187	1.248
20 inches	1	95.351	.553	.806	.530	1.882	.803	.074	11.895	17.337	11.400	40.503	17 272	1.592
	2	.....	.583	.812	.530	1.866	.788	.070	12.540	17.466	11.400	40.137	16.950	1.505
Average		....	.568	.809	.530	1.874	.795	.072	12.217	17.401	11.400	40.320	17.111	1.548

The above table gives the percentage, composition of mangels, Swedes, and turnips cultivated at three different distances apart in the drill. The drills were a little over 27 inches apart. Complete analysis was made of samples unthinned, thinned to 12 inches, and to 20 inches in the drills.

Sampling.

In each instance, half-a-dozen roots were taken; and these roots were of such sizes that the sum of the weights of the six equalled six times the weight of the average weight per root of the entire plot. They were then washed clean, and, after being wiped dry, were cut into a pulp. From the thoroughly mixed pulp a sample representing about two pounds was taken for analysis.

Effects of Different Distances on Composition.

It is probably unnecessary to say that each kind was sown on the same date, and also harvested on the same date; and cultivation throughout was alike. Consequently, any variation in the composition of turnips, Swedes, or mangels left unthinned, thinned to 12, or to 20 inches, would be due to these different distances between the plants in the drills.

In all cases the percentage of water is two to three lower in the unthinned roots than in those thinned to 12 or to 20 inches in the drills. While, in the mangels and turnips, the percentage of water is practically the same where 12 as where 20 inches apart, it gradually increases from unthinned to thinned to 20 inches in the Swedes. In every instance the percentage of ash in the dry matter is least in the unthinned roots. In the mangels it gradually increases with an increase in the distance between the plants; but the dry matter in the turnips and Swedes at 20 inches apart is no greater than at 12 inches. In each, the crude protein is least in the unthinned, and most where thinned to 12 inches. The amides are also least in the unthinned roots. But the nitrogen-free extract is considerably higher in the dry matter of the unthinned roots than in that of the thinned roots. The decrease in the quantity of nitrogen-free extract is much more in the turnips than in either the Swedes or mangels; while the crude fibre in the thinned roots is more than in those unthinned, especially in the turnips. Evidently unthinned roots mature earlier than thinned roots, but the quality of the food contained in them is not so good as that in roots thinned out.

——	Per cent. of dry matter.	Average weight of root.	Yield of roots per acre.	Dry matter per acre.
		lb.	tons.	
Swedes:				
1. Unthinned	12.211	.46	22.60	2.760
2. 4 inches	11.781	1.06	27.78	3.273
3. 8 inches	11.989	2.07	29.75	3.567
4. 12 inches	11.320	2.79	27.25	3.085
5. 16 inches	11.186	3.76	27.10	3.031
6. 20 inches	10.604	4.24	25.00	2.651
Fall Turnips:				
Unthinned	8.423	.18	20.37	1.716
4 inches	5.710	1.28	37.50	2.141
8 inches	4.908	2.60	39.15	1.921
12 inches	4.326	3.89	37.88	1.639
16 inches	4.501	4.99	37.27	1.678
20 inches	4.649	5.42	32.40	1.506
Mangels:				
Unthinned	12.205	.69	38.79	4.734
4 inches	11.471	1.50	39.80	4.565
8 inches	10.713	2.46	37.85	4.055
12 inches	10.523	3.12	35.90	3.778
16 inches	9.391	3.73	33.85	3.179
20 inches	10.757	3.96	29.10	3.130

The above table shows the effects of thinning on the percentage of dry matter, the size of the roots, and the yield yer acre. With one or two slight exceptions there is a gradual decrease in the percentage of dry matter with an increase in the distance between the plants in the drills. Without one exception, the average weight of roots increases as the distance between the plants in the drills increases. But the largest roots do not necessarily give the greatest yield per acre. The third column of figures shows an increase in yield as the distance between the plants increases to 8 inches; but beyond this distance the yield gradually decreases as the distance increases. Regardless of size of roots, Swedes thinned to 8 inches in the drill, turnips thinned to 4 inches, and mangels unthinned yield greater quantities of dry matter than when grown at other distances apart. But bearing in mind the deficient quality of the dry matter in unthinned roots, it would be advisable to grow a few hundred pounds less dry matter per acre to obtain an increased quality of food. *Swedes* clearly give the highest yield of food of the best quality *thinned to a distance of 8 inches;* turnips, though they yield the most pounds of dry matter thinned to 4 inches, only lose about 220 pounds of dry matter per acre thinned to 8 inches. This loss is counterbalanced by the enhanced quality of the dry matter. Both yield and quality considered, *8 inches appears to give the best results.*

CONCLUSIONS.

There are two lines of investigation that press themselves most urgently upon our attention for the coming year. The one is further analysis of milk, cheese and whey in connection with cheese-making; the other is an examination into the conditions of the soil of even well-tilled farms which is not producing the quantities of certain crops which they formerly produced.

To meet the expenses in these connections, we shall require an increased grant.

I again beg to call your attention to our need of the basement of the chemical laboratory for an analytical class-room.

I am, respectfully yours,

A. E. SHUTTLEWORTH,
Professor of Chemistry.

ONTARIO AGRICULTURAL COLLEGE,
GUELPH, Dec. 31st, 1894.

PART IV.

REPORT OF THE

PROFESSOR OF VETERINARY SCIENCE.

To the President of the Ontario Agricultural College:

SIR,—I have the honor of presenting to you my second annual report. During the sessions since my last report I have delivered lectures to the first year students on veterinary anatomy and veterinary *materia medica*, and also a course of practical stable lectures. To the second year students I have lectured on veterinary pathology, veterinary obstetrics and the laws of breeding, and have also delivered a course of lectures on "practical horse." To the special dairy class I gave a course of lectures on the ordinary diseases and accidents to which the dairy cow is subject. To all my lectures the students paid good attention, and the knowledge thereby gained will no doubt be valuable to those who will have the care and breeding of stock under their charge in after life. Outside of my work in the class-room I have given professional attention to the stock of the farm, and I am pleased to say that with the exception of sheep the losses have been comparatively very light. Below will be seen particulars.

Horses. We have had a few cases of indigestion, some wounds, calks, sore shoulders, sore necks, etc., but no fatal or even serious cases of any kind.

Cattle. We had a few cases of abortion in cows, a few cases of metritis, some of retention of the placenta, a couple of partial paralysis, a couple of difficult parturition, a few of impaction of the rumen, etc., all of which made complete recoveries. I must acknowledge that the comparative immunity from loss in cattle and other stock is, to a large extent, due to the careful feeding and general care given by the foreman, Mr. Lamb, who is very attentive and very careful in carrying out instructions. We lost two animals. One was the imported polled Angus bull. I was telephoned for one Sunday evening to go up to see him, but he died before I arrived. A post mortem revealed the formation of an abscess in the throat, which had ruptured internally and caused death very suddenly by suffocation. The other fatal case was that of a grade cow. At first she showed symptons of ordinary impaction of the rumen, with tympanitis. I treated her for such and she showed signs of improvement, but the symptoms returned, and for considerable time they could be relieved only to return again. The symptoms were so persistent that we became satisfied that there was some mechanical obstruction in the stomach or intestines. As she would eat very little we nourished her with flaxseed gruel, etc., but eventually she died, and a post mortem revealed a ball of woody fibre, the size of a large hen's egg, in the *pylorus* (the passage from the fourth stomach into the intestine). This ball was not firmly fastened, and no doubt at times its position became altered, allowing the passage of a certain amount of ingesta, when it would again insinuate itself into the passage, and that accounted for the intermission of the symptons. The obstruction was composed of very fine fibre resembling wool. Mr. Rennie and myself examined it very carefully and came to the conclusion that it was a collection of the fibre of lucerne, of which the animal had eaten considerable. It appears to us that if lucerne be ripe, or nearly so, a portion of the fibre becomes indigestible, and the fibres accumulate and form a ball, which in some cases may act as this one did. In order to make more sure we requested Prof. Panton to examine it. He tested for animal and vegetable matter and pronounced it vegetable. He also macerated a quantity of lucerne and obtained a like fibre.

Sheep. We lost a number of sheep and lambs from different causes. One ewe died from gangrenous metritis; one ram from concussion of the brain, received from fighting; and a yearling ram from the same cause. A few died from diseases of the liver, similar to that of last year, but I think we have done with that trouble now, as the supply of roots fed has been limited, and we think the disease was caused by feeding too much roots containing saccharine matter. We lost a few young lambs from a collection of wool in the pylorus. It is impossible to prevent lambs swallowing more or less of their dams' wool, and it has a great tendency to collect and form a ball which, if of sufficient size, cannot pass through the pyloric orifice, but becomes fastened there and by stopping the passage causes death Then we lost a number of yearlings and a few older ewes from a collection of woody fibre, similar to that found in the cow, obstructing the pylorus. I am of the opinion that lucerne is not safe food for any animal, unless it be cut and cured when rather green. When matured it becomes very dry and woody, and portions of it become quite indigestible. I treated all the lambs this year again regularly with a decoction of pumpkin seeds, in order to prevent loss from tapeworm, and I am pleased to state that I succeeded, as we had no trouble whatever from these pests. In all cases where death occurred from any cause I held a post mortem and examined very carefully for tapeworm, but did not find any. The following is the mode of treatment I adopted: I cut or broke all seeds, then put them in a pot with water, and placed the pot on the stove and let the water come to a boil, then set it back on the stove and let it simmer for 6 to 8 hours, and afterwards strained the fluid; we then drenched each lamb with the product of from one to two and a-half ounces of the seed, according to the size of the lamb. This was done every ten days or two weeks from the middle of May until the middle of August. It entails a good deal of work, especially the preparation of the decoction, but I think the result paid for the trouble, as we have had no losses from tapeworm the two years we have practiced this treatment, and for many years previous the losses from this cause were very heavy. I trust we have now got rid of the worm entirely.

Pigs. There were some losses of newly born pigs, but other than that we lost but two animals, one of which died from inflammation of the bowels, and the other, a young Berkshire boar, died, apparently, from excitement and exhaustion, as a post mortem revealed all organs healthy.

Dehorning of Cattle.

As instructed by you, on the 7th of June I dehorned 16 head of dairy cattle. I used a saw to operate, I had no shears and could not conveniently procure a pair. I have never seen the operation performed with shears, but am of the opinion that the saw is fully as good. As dehorning is not practiced in this section this was my first experience, except an isolated case here and there. I succeeded very well, with no after bad results, except a little trouble in protecting against flies, and the collection of pus in the cavities in two animals. I watched the animals closely, and was informed by Mr. McGillivray, the dairy cattle man, that none of the cows missed a meal or failed in their milk. The little trouble we experienced was caused by the excessively hot weather which followed the operation. I do not consider hot weather a good time for the operation; in my opinion it should be performed in temperate weather, not in the extremes of either heat or cold. Under such circumstances I do not think there would be any trouble, nor do I think the animals would require any after treatment whatever. I also think that the time is near at hand when the operation will be more generally performed, especially in dairy herds. As to the cruelty of the operation it is certainly painful for the time, but it requires only from five to ten seconds per horn with the saw, and still less with shears; then the torture is over, and the cattle become more quiet and peaceable with each other, and under such circumstances cannot injure each other, and will doubtless yield a greater supply of milk.

Tuberculosis.

In my last report I stated that I was carrying on experiments with Prof. Koch's lymph as a diagnostic medium and also as a cure for tuberculosis in the dairy herd at the O.A.C. I have finished the experiments and am now in a position to report the details for testing with the lymph called "tuberculin" as follows: A ten per cent. solution of the lymph in a one per cent. solution of carbolic acid is used. The temperature of the animal is taken, the hypodermic syringe and needle and also the point of injection (I usually select the loose skin just behind the shoulders) are sterilized with, say, a five per cent. solution of creolin or other good disinfectant; then from three to four cubic centimeters (17 drops a c. c.) of the prepared lymph are injected hypodermically into the animal. The temperature is then taken about every hour for from 15 to 18 hours, or longer if it be a suspicious case and the reaction be not well marked. An increase in temperature (called the reaction) of two degrees or over is supposed to indicate the existence of tubercle. If the reaction should not reach two degrees, I would not like to condemn the animal. Considerable difference of opinion exists as to the accuracy of the test, some claiming that it is unreliable and will in some cases condemn healthy animals, and in others fail to cause a reaction in diseased ones. Within the last two years, I have had considerable experience with it, both in the dairy herd and in private practice, and also in witnessing the post mortems of cattle tested by others (the figures of which tests I have seen), and my experience is that in no case does it condemn an animal that is not diseased. Whether it invariably causes the reaction in diseased animals I am not prepared to say, as that is a point very hard to determine, it being possible to do so only by the indiscriminate slaughter of all animals tested, whether condemned by the test or not.

Below the figures of the tests in a few cases are given in order to illustrate thoroughly the manner of testing; but in the majority of cases I give merely the degree of reaction, and in cases that were slaughtered, the post mortem appearances.

No 1 *Guernsey Cow.* Temperature before injection 100 4-5. Injected 4 c.c. lymph at 6.45 a.m.

		Deg.			Deg.
Temperature at	7.45 a.m.	$100\frac{4}{5}$	Temperature at	4.00 p.m.	$102\frac{1}{5}$
	9.00 "	101		5.00 "	$103\frac{1}{5}$
	10.00 "	$101\frac{1}{5}$		6.00 "	$103\frac{1}{5}$
	11.00 "	$100\frac{4}{5}$		7.00 "	$103\frac{1}{5}$
	12.00 m.	101		8.00 "	$103\frac{3}{5}$
	1.00 p.m.	$101\frac{2}{5}$		9.00 "	$104\frac{4}{5}$
	2.00 "	$101\frac{3}{5}$		10.05 "	$102\frac{4}{5}$
	3.00 "	102			

This cow was slaughtered and the post mortem revealed extensive and diffused disease of both pulmonary and digestive organs. We at the same time slaughtered her calf about 10 weeks old (one of twins, the other being still-born) that had suckled its dam, and we found the respiratory apparatus perfectly healthy, but the digestive and genital organs very extensively diseased.

No. 2 *Guernsey Cow.* Temperature before injection 99 4-5. Injected 4 c.c. lymph at 7 a.m.

		Deg.			Deg.
Temperature at	7.50 a.m.	$100\frac{2}{5}$	Temperature at	3.05 p.m.	103
	9.05 "	$100\frac{3}{5}$		6.05 "	$105\frac{4}{5}$
	10.05 "	101		7.05 "	$105\frac{4}{5}$
	11.05 "	$100\frac{4}{5}$		8.05 "	$106\frac{1}{5}$
	12.05 p.m.	$101\frac{3}{5}$		9.05 "	107
	1.05 "	102		10.10 "	$105\frac{2}{5}$
	2.05 "	102			

This cow was slaughtered and the post mortem revealed diffused and extensive tubercular deposits in both thoracic and abdominal viscera.

No. 1 *Jersey Cow.* Temperature before injection 101. Injected 3 c c. lymph at 6.40 a.m.

	Deg.		Deg.
Temperature at 10.15 a.m.	$101\frac{1}{5}$	Temperature at 5.15 p.m.	$101\frac{1}{5}$
12.05 p.m.	$101\frac{1}{5}$	7.55 "	$101\frac{1}{5}$
2.15 "	$101\frac{1}{5}$	9.00 "	101
3.35 "	$101\frac{1}{5}$		

This cow, as will be seen, did not react, the highest point reached in 15 hours being but 1-5 of a degree higher than the starting point, while an animal in perfect health will often vary much more than that in the same time.

By the foregoing figures the mode of testing can be readily understood, therefore I will not in what follows give the full figures. In many cases the animals were tested more than once, and in such cases I will give the degree of reaction in each test and also the post mortem appearances.

	Degree of reaction.	Conclusion.
No. 1 *Ayrshire Cow*..............	2-5 degrees.	Sound.
No. 1 *Grade Cow*...............	1 "	"
No. 1 *Holstein Cow*..............	2 3-5 "	Condemned.

This cow was slaughtered and the post mortem revealed the bronchial glands and both lungs extensively diseased.

No. 3 *Guernsey Cow.* Tested Oct. 1893. Reacted 6 degrees.
" Dec. 1893. " 5 "

Post mortem revealed a large tubercular deposit in the liver, and extensive disease of the bronchial glands and right lung. Left lung slightly inflamed.

No. 1 *Holstein Heifer.* Tested Oct. 1893. Reaction 5 1-5 degrees.
" Dec. 1893. " 5 4-5 "

Post mortem revealed the bronchial glands and both lungs extensively diseased.

No. 2 *Ayrshire Cow.* Tested Oct. 1893. Reaction 3 3-5 degrees.
" Dec. 1893. " 1 1-5 "

Post mortem revealed the apex of right lung affected in the early stage. Well marked tubercles in substance of left lung.

Devon Grade Heifer. Tested Oct. 1893. Reaction 6 1-5 degrees.
" Dec. 1893. " 5 1-5 "

Post mortem revealed well-marked and extensive tubercular deposits in the bronchial glands and in the substance of both lungs.

No. 6 *Grade Cow.* Tested Oct. 1893. Reaction 4 3-5 degrees.
" Dec. 1893. " 3 3-5 "

Post mortem revealed the peritoneum diseased and attached to the abdominal walls. Large tubercular abscess in the liver, and the bronchial glands affected.

Guernsey Bull. Tested July 1893. Reaction 5 4-5 degrees.
" Oct. 1893. " 4 1-5 "
" Dec. 1893. " 3 3 5 "

Post mortem revealed the bronchial glands and the substance of both lungs extensively tubercular.

No. 2 *Jersey Cow.*	Tested Dec. 1893.	Reaction	1-5 degrees.	Sound.
No. 1 *Jersey Cow.*	" "	"	2-5 "	"
No. 1 *Grade Cow.*	" "	"	4-5 "	"
No. 2 *Grade Cow.*	" "	"	5 1-5 "	Condemned.

Post mortem revealed slight but well marked tubercular deposits in the bronchial glands.

No. 3 *Grade Cow.* Tested Dec. 1893. Reaction 3 4-5 degrees.

Post mortem revealed a small tubercular deposit in the liver.

No. 1 *Ayrshire Cow.* Tested Dec. 1893. Reaction 4-5 degree. Sound.

Jersey Heifer. Tested Dec. 1893. Reaction 4 1-5 degrees. Condemned.

Post mortem revealed extensive disease of the bronchial glands, diffused tubercular deposits in the substance of both lungs. Left lung slightly inflamed.

No. 1 *Guernsey Calf.* Tested Dec. 1893. Reaction 2-5 degree. Sound.

Holstein Heifer. Tested Dec. 1893. Reaction 5 1-5 degrees. Condemned.

Post mortem revealed the bronchial glands, left lung and the liver extensively affected.

No. 1 *Holstein Bull Calf.* Tested Dec. 1893. Reaction 4 4-5 degrees.

Post mortem revealed the bronchial glands affected and diffused tubercular disease of the liver.

Jersey Bull Calf. Tested Dec. 1893. Reaction 3-5 degree. Sound.

No. 2 *Guernsey Bull Calf.* Tested Dec. 1893. Reaction 4-5 degree. Sound.

No. 2 *Holstein Calf.* Tested Dec. 1893. Reaction 1-5 degree. Sound.

Ayshire Bull Calf. Tested Dec. 1893. Reaction 2-5 degree. Sound.

Ayrshire Bull. Tested Feb. 1894. Reaction 0 degree. Sound.

No. 2 *Holstein Cow.* Tested Feb. 1894. Reaction 2-5 degree. Sound.

Jersey Grade Heifer.	Tested Dec. 1893.	Reaction 4 3-5 degrees.	Condemned.
	" Feb. 7, 1894.	" 3 "	
	" " 27, "	" 1 1-5 "	

This calf was sent to Professor Smith, of the Ontario Veterinary College, and the Professor informed me that the post mortem revealed tubercle in the bronchial glands, but only upon microscopical examination.

No. 4 *Grade Cow.*	Tested May 1894.	Reaction 0 degree.	Sound.
No. 5 *Grade Cow.*	" "	" 1-5 "	"

No. 2 *Guernsey Bull Calf.*	Tested Dec. 1893.	Reaction 1 degree.
	" Feb. 1894.	" 1 "
	" May 1894.	" 1 2-5 "

No. 2 *Holstein Bull Calf.*	Tested Dec. 1893.	Reaction 1-5 degree.
	" Feb. 1894.	" 0 "
	" May 1894.	" 0 "

No. 3 *Guernsey Heifer Calf.* Tested May 1894. Reaction 3-5 degree.

(This calf was about 7 weeks old.)

It will be seen that the tests did not condemn the above three calves; but as they were the produce of diseased parents, it was not considered wise to keep them for breeding purposes and I was instructed to slaughter them. Professor Mackenzie came up from Toronto, and we held very careful post-mortems on them, but could find no trace of the disease, which demonstrates the fact that the disease is, at least, not necessarily congenital, even though both parents should be affected.

No. 4 *Guernsey Cow.*	Tested October, 1893.	Reaction 5 degrees.
	" December, 1893.	" 1 1-5 "
	" Feb. 7, 1894.	" 2 4-5 "
	" Feb. 27, 1894.	" 1 2-5 "
	" May, 1894.	" 0
	" June, 1894.	" 1 4-5 "

Post mortem revealed the bronchial glands and left lung extensively diseased.

No. 3 *Holstein Cow.*	Tested October, 1893.	Reaction 5 4-5	degrees.
	" December, 1893.	" 1 2-5	"
	" Feb. 7, 1894.	" 1 1-5	"
	" Feb. 27, 1894.	" 1 2-5	"
	" May 1894.	" 2	"
	" June 1894.	" 4-5	"

Post mortem revealed the laryngeal glands extensively diseased, liver adherent to diaphragm, and slight disease of the bronchial glands.

No. 1 *Ayrshire Heifer.*	Tested December, 1893.	Reaction 4 2-5	degrees.
	" Feb. 7, 1894.	" 3	"
	" Feb. 27, 1894.	" 3-5	"
	" May 1894.	" 0	
	" June 1894.	" 0	

Post mortem revealed slight but well-marked tubercles in the bronchial glands.

No. 1 *Guernsey Heifer.*	Tested December, 1893.	Reaction 0 3-5	degrees.
	" May 1894.	" 5 2-5	"
	" June 1894.	" 4 4-5	"

Post mortem revealed extensive tubercular disease of the bronchial glands.

Red Polled Heifer.	Tested December, 1893.	Reaction 4 4-5	degrees.
	" Feb. 7, 1894.	" 3 3-5	"
	" Feb. 27, 1894.	" 1 3-5	"
	" May, 1894.	" 4	"
	" June, 1894.	" 2 2-5	"

Post mortem revealed extensive tuberculosis of the bronchial glands.

Red Polled Cow.	Tested October 1893.	Reaction 3 3-5	degrees.
	" December, 1893.	" 1 4-5	"
	" Feb. 7, 1894.	" 1	"
	" Feb. 27, 1894.	" 0 4-5	"
	" May, 1894.	" 1 2-5	"
	" June, 1894.	" 1	"

Post mortem revealed diffused tuberculosis of the bronchial glands and both lungs. The liver adherent to the diaphragm with suspicious nodules.

Ayrshire Bull Calf.	Tested December, 1893.	Reaction 0 2-5	degrees.
	" Feb. 27, 1894.	" 5	"
	" May, 1894.	" 5	"
	" June, 1894.	" 2	"

Post mortem revealed slight disease of the bronchial glands and extensive disease of the substance of both lungs.

No. 3 *Ayrshire Cow.*	Tested October, 1893.	Reaction 4 1-5	degrees.
	" December, 1893.	" 3 2-5	"
	" Feb. 7, 1894.	" 0 4-5	"
	" Feb. 27, 1894.	" 0 2-5	"
	" May, 1894.	" 0 3-5	"
	" June, 1894.	" 1	"
	" August, 1894.	" 0	

This cow was then injected with 4 c.c. lymph every Monday morning from September 3rd until November 12th, 1894, inclusive, making in all eighteen injections. In the meantime she lost her sight.

When slaughtered the post mortem revealed diffused and extensive tuberculosis of the bronchial glands, pleuro adherent to the thoracic walls, lung substance healthy, diffused disease of the serous lining of the stomach, stomach adherent to the diaphragm and abdominal walls, mesenteric glands very much enlarged and containing considerable quantities of tubercular matter, well marked inflammation of portions of the floating colon, extensive tubercular disease of the uterus, the mucous membrane of which was very largely diseased.

No. 2 *Ayrshire Heifer.*	Tested	December, 1893.	Reaction	5 2·5 degrees.
	"	Feb. 7, 1894.	"	5 1·5 "
	"	Feb. 27, 1894.	"	1 1·5 "
	"	May, 1894.	"	0 2·5 "
	"	June, 1894.	"	1 3·5 "
	"	August, 1894.	"	0 2·5 "

This heifer was then injected every week the same as the last-mentioned, making in all seventeen injections.

The post mortem revealed the bronchial gland and pleura extensively diseased, a few small tubercles in the right lung, liver and the mesenteric glands slightly diseased.

No. 3 *Ayrshire Heifer.*	Tested	October, 1893.	Reaction	3 2·5 degrees.
	"	December, 1893.	"	2 2·5 "
	"	Feb. 7, 1894.	"	0 1·5 "
	"	Feb. 27, 1894.	"	0
	"	May, 1894.	"	0 2·5 "
	"	June, 1894.	"	0 1·5 "
	"	August, 1894.	"	0 1·5 "

This heifer was then injected as the last-mentioned, making in all eighteen injections.

The post mortem revealed tubercular deposits in pharyngeal glands, a large tubercle in the liver, the mesenteric glands slightly affected, and some small tubercles in the lung substance.

It will be seen that quite a number of the animals were tested several times, especially the three last mentioned, with a view to ascertain whether the lymph has any curative powers if injected repeatedly. The post mortems of these animals did not indicate any such action. In fact in some cases, especially in the Ayrshire cow, No. 3, the indications point rather to the fact that repeated injections tend to diffuse the disease. Towards the last, this cow did not do well ; she went blind without any appreciable cause. She was well looked after, and the stable in which we had her and the others isolated was well ventilated. In my opinion she would soon have died from inflammation of the intestines, as there was well marked inflammation, of apparently a subacute form, in considerable portions of the floating colon ; and I could account for the inflammation in no other way than from the effects of the diffused and extensive tuberculosis of the coats of the intestines and subjacent organs. It will also be noticed in animals that were tested several times, that the reaction was well marked only on the first, or the first two injections. It appears in many cases to require a considerable time to elapse between injections in order to get a reaction. This of course teaches us that there is little reliability to be placed upon the effects of tests after the first.

Note the facts in the cases of the Ayrshire bull calf and the Guernsey calf No. 1. Both of these animals passed the test the first time, but the reaction in both cases was well marked in the second test. This is hard to explain, as I do not think it possible that they could have received the germs of the disease in the meantime, as they were kept in the stable after it had been thoroughly disinfected. It may be that they contained the germs at the first injection, but in such an early stage that they had not become sufficiently localized to cause a reaction ; or, as I have already stated, it is possible that an animal may be diseased and still not react. I think the first theory the more probable.

As to the disease being hereditary, opinions differ That the predisposition to the diseases is congenital is generally admitted ; but whether the disease itself is congenital (that is, whether an animal, the produce of diseased parents, has tuberculosis when born) is a point on which opinions differ It is claimed by some that germinal tuberculosis never does occur, that is, that the off-spring cannot acquire the disease from the seed of either parent, but that it may be possible for the foetus to acquire the disease through the maternal circulation, if the dam be affected. I favor this theory ; and if it is correct, we can see that there is no danger of the offspring inheriting the disease from the sire in any case, but of course the predisposition to contagion can be transmitted by the sire. Our experiments go to demonstrate the fact that congenital tuberculosis is at least not common. Note the No. 1 Guernsey cow's calf. This calf suckled his dam, and the post mortem revealed the respiratory organs healthy, but extensive tubercular diseases of the digestive organs. As will be seen by the post mortems recorded here (and it is also a well-known fact), the respiratory organs are the favorite seat of the disease. Are we not therefore warranted in assuming that the calf was born healthy and if fed on pure milk would in all probability have remained so, but being reared on the milk of his dam, which was very extensively diseased, it acquired the disease from the milk. The baccillus in the milk first coming into contact with the digestive organs, lodged there and multiplied, while, if the disease were congenital, we should expect to find it in the respiratory orgaus. In my last report I stated that I did not consider that there was danger in using the milk of a tubercular cow, unless the udder or lacteal apparatus is diseased. Since then I have had reason to change my mind on this point, as Prof. Mackenzie discovered the baccillus of tuberculosis in the milk of cows in which the post mortems revealed these organs free from the disease, the baccillus no doubt gaining access to the milk through the circulation of the blood. Note also the three calves, No. 2 Guernsey calf, No. 2 Holstein bull calf and No. 3 Guernsey calf. These three were the progeny of diseased parents, and I am informed were reared as follows: Allowed to suckle the dam for a few days after birth and then taken from her and fed the mixed milk of the herd. Whether they received the germs in the milk or not is impossible to say, but if so not in sufficient numbers to affect them, as the post mortem revealed all organs healthy, which also shows that the disease is not often congenital, nor yet in all cases easily acquired. I think the disease is much oftener contracted by the inhalation of the germs than by their introduction into the stomach.

As regards the efficiency of the test, I have come to the following conclusions It may be that it will not always condemn a diseased animal, but I have never known it to condemn a healthy one. The first test is the only one upon which much dependence can be placed. The injection of the lymph has no physiological effect on a healthy animal beyond possibly exciting a very slight degree of fever for a few hours While in a diseased animal, besides exciting a much better-marked fever, it is often followed by general disturbance, such as loss of appetite and condition, diminished supply of milk, a tendency to abort, etc. The degree of reaction does not determine the extent of the disease ; but I have noticed that in cases where the reaction has taken place shortly after the injection, say six to ten hours, the animal has had rather extensive disease, while in a case where the reaction was longer in manifesting itself, say twelve to eighteen hours, there was but slight disease. In some cases it requires a very careful post mortem to discover the disease. In the case of the No. 3 grade cow this was noticed. All that was found in her was a small nodule in the liver. I think it probable that in cases where the injection of the lymph has caused a reaction and no disease has been discovered in the post mortem (as some claim), the reason is that a sufficiently careful post mortem has not been held, as mostly any organ in the body, even the brain or spinal cord, may be the seat, and if the disease be slight it is often hard to find.

Respectfully submitted,

ONTARIO AGRICULTURAL COLLEGE, J. HUGO REED, V.S.

GUELPH, December 31, 1894.

PART V.

REPORT OF THE HORTICULTURIST.

To the President of the Ontario Agricultural College :

SIR,—I have the honor to submit herewith my report for the Horticultural Department for the year 1894. I take pleasure in doing so, because I feel that, although in some respects I have made but a beginning in the work to be done, yet the beginning has been successful. I am pleased to say that the work has been lightened by the hearty support and encouragement I have received from yourself and the other members of the staff, the respectful attention of the students to one so lately of their number, and the faithful performance of duties by the men over whom I have charge. When entering upon my duties here a year ago I fully realized the responsibilities resting upon me, and from the past year's experience I feel assured that, with a continuance of such co-operation the Horticultural Department will become more and more valuable to the institution and the country at large, as well as more creditable to the Government which so liberally supports it.

The report of the year's work can be most conveniently given under the following headings :

I. Teaching.

II. Management of the Horticultural Department.

III. Fruit Experiment Stations.

I. TEACHING.

This being a college as well as an experimental farm, our first duty here is to give instruction to the students. The instruction is given by means of lectures in the class-room and practical work in the greenhouses, orchards, and gardens. Lectures on horticulture are given twice a week throughout the year to the second-year students, and are illustrated as far as possible by specimens and object lessons in the class-room. The following is a brief outline of the work covered in the course of lectures :

FRUIT GROWING.

INTRODUCTION.—Brief history of horticulture ; extent and importance of the industry ; Ontario as a fruit-growing country ; the outlook for the fruit industry ; requisites for the business.

LEADING PRINCIPLES IN THE GROWTH OF TREES.—Description and function of roots, stems, branches, buds, leaves, flowers, fruit and seeds.

PRODUCTION OF NEW VARIETIES.—Species and varieties ; natural and artificial pollination ; crossing and hybridizing.

PROPAGATION OF VARIETIES.—By cuttings, layers, grafting, and budding.

SETTING OUT ORCHARDS AND FRUIT PLANTATIONS.—Suitable soils and situations ; distances for planting ; marking out the ground ; obtaining nursery stock ; transplanting ; watering ; mulching.

General Management of Orchards and Fruit Plantations.—Cultivation; manuring, spraying, thinning fruit; implements suitable for the different operations.

Different Kinds of Fruit.—Apples, pears, quinces, peaches, plums, apricots, cherries, grapes, raspberries, blackberries, currants, gooseberries, strawberries, etc, treated of in detail according to the following syllabus: (1) History and botanical matter; (2) Extent of cultivation; (3) Methods of propagation: (4) Soils suitable; (5) Culture required; (6) Methods of pruning and training; (7) Time and manner of harvesting; (8) Packing and marketing; (9) Method of keeping and storing; (10) Varieties grown.

VEGETABLE GARDENING.

Gardening as an Occupation.—Extent and importance of the industry; market gardening near large towns and cities.

The Farmer's Garden.—Location, size, and soil suitable.

Fertilizers for the Garden.—Barn-yard manure; composts; artificial fertilizers; time and manner of applying them.

General Management of Garden.—Preparation for and cultivation of crops; rotation of crops; plan of garden.

Garden Seeds.—Method of obtaining; vitality; time and manner of sowing; conditions favorable to germination.

Raising Plants.—Construction and management of hot-beds and cold frames; transplanting.

Forcing Garden Crops.—Illustrated by growth in the green-houses of radishes, lettuce, onions, tomatoes, cauliflowers, cucumbers, melons, rhubarb, mushrooms, etc.

Garden Crops.—*Roots*—Beet, carrot, parsnip, salsify, radish, turnip. *Tubers*—Potato, artichoke. *Bulbs*—Onion, leek, garlic. *Stems*—Asparagus. *Leaves*—Cabbage, lettuce, spinach. *Leaf-stalks*—Celery, rhubarb. *Flowers*—Cauliflower, broccoli. *Seeds*—Peas, beans, corn. *Fruit*—Melon, citron, squash, pumpkin, egg plant, cucumber, tomato, pepper. *Herbs*—Sage, savory, mint, etc. *Fungi*—Mushrooms. Treated of in detail according to the following syllabus: (1) History and botanical matter; (2) Importance and extent of cultivation; (3) Soils and fertilizers suitable; (4) Propagation; (5) Culture and general management; (6) Harvesting; (7) Packing and marketing; (8) Storing; (9) Varieties grown.

LANDSCAPE GARDENING.

Location of buildings; making and care of lawns; kinds, arrangement, and care of trees, shrubs, vines, hedges, and flower beds; course and construction of walks and drives; general surroundings.

ARBORICULTURE.

Importance of forests; their effect on climate; different kinds of trees; their occurrence, habits, and uses; where trees should be planted; raising trees from seed; planting operations; transplanting large trees; care and management of trees, with a view to ornament, shelter, and economy.

FLORICULTURE.

Soil for house plants; methods of potting; propagation of plants; effect of atmosphere, temperature, and light on plants; watering; trimming and training; treatment of frozen plants; resting plants; kinds of plants suitable for window or conservatory, hanging baskets, rockeries, flower beds, etc.; arrangement of plants for effect.

During the past year quite an addition has been made to the list of horticultural books in the library, and from time to time various books have been recommended for reading in connection with the lectures. The examinations are based partly on the students' reading, as well as on the lectures. The following are a few of the books recommended on the different subjects treated:

Fruits.—Downing's Fruits of America; The American Fruit Culturist (Thomas): Barry's Fruit Garden; Small Fruit Culturist (Fuller); The Nursery Book (Bailey).

Vegetables.—How to Make the Garden Pay (Greiner); Gardening for Profit (Henderson); Success in Market Gardening (Rowson); The Vegetable Garden (Vilmorin-Andrieux).

Landscape Gardening.—Ornamental Gardening for Americans (Long); Landscape Gardening for Farmers (S. C. Moon in Report Penn. Board of Agr., 1889).

Arboriculture.—Practical Forestry (Fuller); Trees of North-Eastern America (Newhall); Ontario Forestry Reports.

Floriculture.—Your Plants (Sheehan); Vick's Home Floriculture; Practical Floriculture (Henderson.)

Practical Instruction, besides that obtained from their regular work in the greenhouses and garden and orchard, was given during the winter to both first and second year students in the various methods of grafting fruit trees and ornamental plants. In the early spring they received practice in pruning raspberries, currants, gooseberries, etc.: and later on in the season, when the fruit trees were in bloom, they received instruction in production of new varieties by crossing and hybridizing. All of these operations being performed by the students themselves, they took great interest in the work. It is the intention during the coming season to emphasize this method of practical instruction as much as possible by having the students perform for themselves, under close personal supervision, the various operations that may be carried on in the greenhouse, garden, and orchard.

BOTANICAL LABORATORY AND GREENHOUSES.

HAULING IN HAY, JUNE, 1894.

II. MANAGEMENT OF THE HORTICULTURAL DEPARTMENT.

The Greenhouses.

In extent and completeness our greenhouses are probably unequalled by those of any similar institution on the continent. There are six of these enclosing an area under glass of a little over seven thousand square feet. I will mention the different houses in order of arrangement, giving a brief account of the uses to which each has been put.

The Forcing House is 64 x $20\frac{1}{2}$ feet inside measurement. This house was originally intended for growing roses, being built with benches ranging one above the other from the front to the back of the house. We have thought advisable, however, to devote it to the forcing of vegetables during the winter months. On one of the lower benches radishes and lettuce were grown in succession all winter. In the spring these were followed by muskmelons. The former yielded abundantly, and the latter, although not a decided success, showed that melons may be grown in the greenhouse if attention is paid to artificial pollination. One of the finest crops raised in this house last winter was cauliflower. Sixty of these were grown on one of the centre benches, on a space 24 feet long by $3\frac{1}{2}$ feet wide, the soil on the bench being but $4\frac{1}{2}$ inches deep. They made rapid growth and every one of them headed, forming beautiful, compact, tender "curds," averaging from 7 to 9 inches in diameter. This crop was followed by lettuce, and that again by garden peppers, both of which yielded well. On one of the upper benches, 3 feet wide, two rows of tomatoes were planted and trained on wire trellises. Bees not being in the house to fertilize the blossoms, this was effected by shaking the trellises. The fruit set well and the vines bore steadily for the greater part of the winter, yielding a good crop. The growing of vegetables under glass in winter is a branch of horticulture that needs developing, and will no doubt prove quite profitable. Already some of our most enterprising growers have made a start in this direction. At Grimsby two large greenhouses have been erected for this work, and for the past two or three seasons have been shipping large quantities of tomatoes to the city markets, many of them going to the New York market, where they sell at from 30 to 50 cents per pound.

It is our intention to give more attention to this work in the future, and, if possible, find out to what extent it may be profitably carried on. During the coming winter we intend utilizing the space under the benches by growing mushrooms and forcing rhubarb. The latter is already up several inches high and will soon be ready for use. During the summer and fall the forcing house was used for growing chrysanthemums, of which more will be said later on.

The Propagating House, like all of the other houses, is 64 feet long inside. It is fitted up with a propagating bench 3 feet wide, running the entire length of the house. Nearly all of the many thousands of plants required for bedding every year, and which are propagated by means of cutting, are started on this bench in 3 inches of clear, gritty sand. As soon as well rooted they are potted off into 2-inch pots. At one end of this house we have had put in a propagating oven in which, by means of a close fitting glass top and extra heating pipes coiled in a tank of water below, a very moist atmosphere and steady high temperature can be maintained. In this "oven" hard-wooded and slowly-rooting plants can now be readily started.

Along the wall of this house are three tiers of shelves, running the full length of the house on which such plants as gloxinias, achimenes and tuberous begonias are stored after blooming. In the early spring, when these plants were in bloom and out of this house, these shelves came in very useful for starting the seed potatoes used for very early planting. Being thus fully exposed to the light, the sprouts on the potatoes were short, stout and green, and when planted came up rapidly, giving potatoes a couple of weeks earlier than could have been obtained from unsprouted tubers.

The Horticultural Laboratory is 64x$11\frac{1}{2}$ feet inside, and is fitted up with a wide central walk and benches on each side. This house is for the use of the students in doing practical work, and carrying on original investigations. To facilitate this work, the benches on each side of the walk are divided into sections four feet long, each student having for his own use two sections, one being a slate-covered bench on which to keep pot-grown plants, and the other a bench of soil six inches deep, in which plants are grown. On the former, during the past winter, were kept such plants as geraniums; coleus and fuchsias, on which the various methods of grafting were practised. Petunias, also, were grown for practice in artificial pollination. On the soil benches were grown such plants as potatoes, tomatoes and cucumbers, which were not only useful as affording a means of studying the habits and requirements of these various economic plants, but they each yielded a good crop at a season of the year when such things as new potatoes, fresh tomatoes and green cucumbers had a high scarcity value.

After the students had finished their work in this house in the spring, it was given up to the growing of English forcing cucumbers. These occupied the house for the greater part of the summer. The vines were trained up the sides to the ridge in the centre of the house, forming a long green arch, which, when hanging full of fine large cucumbers ranging from one to two and one-half feet in length, was a sight greatly admired by many hundreds of summer visitors.

The following five varieties were grown :

Empress of India, averaging 19 cucumbers to a vine, and the cucumbers averaging 14 inches in length. The most productive variety tried.

Carter's Model, averaging 18 cucumbers to a vine, and the cucumbers avering 20 inches in length.

Rollison's Telegraph, averaging 17 cucumbers to a vine, and cucumbers averaging 18 inches in length. One of the finest quality.

Duke of Edinburgh, averaging 16 cucumbers to a vine, and cucumbers averaging 18 inches in length. Soon becomes yellow and tough.

Chapin's Wonder, averaging 14 cucumbers to a vine, and cucumbers averaging 22 inches in length. Some of the finest specimens of this variety measured 34 inches in length.

The Intermediate House is 64x17 feet, and is fitted up with three-feet side benches and a five-feet centre bench. It contains a varied lot of greenhouse plants, but principally those which are being grown from time to time to keep up the succession of bloom in the conservatory, the plants being at a stage of growth intermediate between those being started in the propagating house and those in bloom in the conservatory. The greater number of plants in this house at the present time are geraniums, cinerarias, calceolarias, stevias and begonias.

Although this house is amply large enough to bring on all the plants required for inside bloom, yet it will, by no means, accommodate the many thousands of plants which have to be grown every year to fill the large flower-beds on the lawn. These, after being changed from 2-inch to 4-inch pots early in the spring, are put outside under hot-bed and cold frame sashes, and gradually hardened off by raising or removing the sashes during fine weather, so as to prepare them for their final removal to the flower-beds.

The Tropical House is 64x20 feet inside, with an eight-foot centre bench and three foot side benches. By means of extra heating pipes this house is kept at a steady high temperature, in which tropical plants grow luxuriantly. It is stocked with a great variety of rare ornamental and useful plants.

We have been endeavoring to get a good collection of economic plants that will be useful for instructive purposes. Among those to be found in this house are the following : *Musa Cavendishii*, a dwarf species of the banana, one of the plants of which is at present bearing a large truss of fine fruit. *Citrus aurantium*, the orange ; *Citrus limonum*, the lemon ; *Ficus Carica*, the fig ; *Olea europæa*, the European olive, which furnishes the olive oil of commerce ; *Punica Granatum*, the pomegranate ; *Cocus nucifera*, the cocoanut palm ; *Phytelephas macrocarpa*, the ivory-nut palm, the nut of which is manufactured into buttons, umbrella-handles, door-knobs, etc. ; *Cycus revoluta*, the sago palm, from the pith of which a kind of sago is obtained ; *Coffea arabica*, the coffee tree ;

Piper nigrum, from the dried berries of which are obtained both the white and black pepper of commerce; *Cinnamomum camphora*, from the roots, stems and leaves of which camphor is obtained by distillation; *Zingiber officinale*, the underground stem of which gives the ginger of commerce; etc.

The Conservatory, our largest house, is 64x25 feet inside, with a wing 20x25 feet, the ridge being 20 feet high. Running all around the sides of the conservatory are stages for the display of plants in bloom. On these we aim to keep up a succession of bloom of some kind the whole year round. At present (Nov. 15) the great attraction is the show of chrysanthemums. We have about seventy different varieties of these, and grow, on an average, four pots of each variety. Seventy seedlings were tried this year, but none of them have proved equal to already-named varieties. The chrysanthemum bloom lasts for six weeks or two months, and is a great attraction while it lasts. During the past three weeks hundreds of visitors from far and near have visited the conservatory, and many have declared it the finest display they ever saw. We wish that more of our farmers with their wives and daughters could see the conservatory at this time of the year.

After the chrysanthemums are over, the succession of bloom is kept up with such plants as begonias, salvias, geraniums, pelargoniums, primulas, cinerarias, calceolarias, lilies, hyacinths, tuberoses, fuchsias, etc. Along with these are staged such plants as rex begonias, coleus, acalyphas, ferns, etc., which are remarkable for their beauty of foliage.

In the centre of the house is a fountain, with a circular stone basin 12 feet in diameter and three feet deep, in which water lilies and other aquatic plants are grown.

In the 14-foot space enclosed by the walks running the length of the house, are grown those larger plants and trees which require all the height of the house. Among those grown here are a number of the Australian blue gum trees (*Eucalyptus globulus*), India-rubber trees (*Ficus elastica*), Australian silk oaks (*Grevillea robusta*), several varieties of Arancarias, a couple of century plants (*Agave Americana*) over thirty years of age and standing about 10 feet high, some large specimens of New Zealand flax (*Phormium tenax*), besides a number of club, date, rattan and other palms.

Labelling Greenhouse Plants.

That a collection of plants such as we have here may be of value to students and of interest to visitors, the plant should be plainly labelled. The ordinary wooden labels on which the name is written with a lead pencil, may do very well for commercial greenhouses; but where plants are kept for instructive purposes or for display, these do not meet the requirements. In our endeavor to get a good kind of label, we have at last hit on one that is giving great satisfaction, and one which might be of value in other public greenhouses or even in private conservatories.

It consists of a celluloid card, on a wire support. The celluloid we get from an organ factory in the city, and is the waste from the facing of the organ keys. It is 1-16 of an inch thick, and we have it cut into two sizes of labels, a small one $1\frac{1}{4}$ x 3 inches for ordinary sized plants, and a large one $1\frac{1}{2}$ x $3\frac{1}{2}$ inches for larger plants. On these cards both the botanical and common names are neatly printed, the botanical names being syllabified and accentuated so that students may readily become familiar with their proper pronunciation.

The ink used for the printing is a glossy, black paint, made of drop black and varnish, thinned with turpentine, so that it will flow readily from a pen point. It soon dries and is not affected by water.

The support for the card is made of No. 16 steel wire, which should be galvanized to prevent it rusting. The wire is cut 8 or 10 inches long and a small coil made in the centre by wrapping it tightly about a $\frac{3}{8}$-in. rod. The celluloid card is held firmly between the loops of the coil and can be set at any desired angle by bending back the coil on the supports which are stuck in the pot.

This makes a label which is at once neat, legible, cheap and durable. During the past year all of the plants in the greenhouses have been labelled with such labels, and as a result students at work in the houses soon become familiar with the names of the plants and naturally take much more interest in them.

Some of these labels may be seen in the photograph of the conservatory.

The Lawn.

The lawn and grounds surrounding the various buildings require a good deal of labor and attention during a greater part of the year. The lawn itself, which covers an area of about twenty-three acres, has been gone over regularly with the mower and kept smooth and well shorn. The many tree and shrubbery clumps dotted about the lawn have been trimmed and kept well cultivated. The grass edges, bordering the walks, drives and shrubbery clumps, estimated at six or seven miles in length, have all been gone over with the edging knife and kept neat and trim ; and many of the drives have been improved with an additional covering of screened gravel. During the winter the drives were kept in good condition by running over them after every heavy fall of snow with a large land roller, a practice which might with advantage be employed on many a country road. The large flower beds in front of the College building and the smaller ones on other parts of the lawn were set out with new designs and the plants carefully attended to throughout the season. With the attention given, the plants made excellent growth, and from June till November presented a sight which was greatly admired by the many thousands of excursionists from all parts of the country. During the year much improvement has been effected in different parts of the grounds. At the rear of the shop and tool sheds the grounds have been levelled and seeded and a number of trees planted out. About the new dairy and poultry buildings, the grounds have also been levelled and seeded and a number of new walks and drives laid out and gravelled.

The Vegetable Garden.

The vegetable garden is five and four-fifths acres in extent. By a system of close cropping it is made to yield enough of all vegetables, with the exception of potatoes, to supply the needs of the College.

The severe drouth during the summer somewhat checked the growth and reduced the yield of early crops ; but the long period of favorable weather following greatly helped the later maturing ones, and these yielded abundantly.

Although a number of the leading varieties of mostly all kinds of garden crops are grown, no attempt has yet been made to measure and compare the yields from different varieties. This is a branch of the work we hope soon to be able to undertake. In the meantime we are putting the garden in a suitable condition for carrying on such work. This fall it has all been thoroughly underdrained—something it has long needed. Next spring we intend having it deeply subsoiled and all stones near the surface removed. In this way it is hoped to make the soil not only more friable, but more productive.

Orchards and Fruit Plantations.

This is by far the least developed branch of work belonging to this department, and one which with the best of management will take a number of years to become what it should be. The trees making up our apple orchard are scattered in several different places. Those in the orchard planted in 1881 are more an object of pity than pride ; year after year the trees here and there have succumbed to the attacks of borers ; and during the past season more than half of what remains of this orchard has given place to the new poultry buildings and yards.

The new orchard was started in 1890. It consists of 112 apple and 20 pear trees. All of the young trees set at that time have done fairly well. Some, however, were older trees transplanted from the old orchard ; and most of them, although they have lived, have been so stunted that they will have to be replaced with young trees.

The grape vines set out at the same time were this year put on a trellis, and bore a small quantity of fruit. Usually the vines in this section have to be laid down and covered for winter protection. Last year one upright cane from each vine was left uncovered, and all came through the winter without injury. This year we are following up that experiment and training each vine on a combination of the Renewal and Kniffen systems. The vines trained according to the Renewal system are laid down and covered with earth in the fall; those trained according to the Kniffen system are left unprotected on the trellis. In this way we hope to find out to what extent winter protection is necessary for grapes in this section.

A plantation of small fruits, consisting of currants, gooseberries, raspberries and strawberries was also set out in 1890. The currants have made a good growth; and all, with the exception of the black varieties, yielded a good crop this year. The gooseberries also yielded well, although the bushes have in the past been considerably weakened by a leaf-spot fungus (*Septoria ribis*) which causes the leaves to fall prematurely in August. Those sprayed this year with the Bordeaux mixture retained a luxuriant foliage till late in the season, which will no doubt add greatly to their vigor and productiveness another year. Spraying with Paris green proved very effective in keeping both currant and gooseberry bushes free from the worm (*Nematis ventricosus*) which usually defoliate the bushes.

The red and white varieties of raspberries have all done well, and this year produced a fair crop considering the dry season. The black caps, however, have nearly all been killed out with the raspberry anthracnose (*Glœosporium venetum*), a fungus affecting the canes. As soon as another plantation can be put out we hope to be able to show that this disease can readily be held in check by spraying with copper sulphate solution of Bordeaux mixture. At present there are not enough of the bushes left to experiment on.

The strawberry crop this year was considerably lessened by late spring frosts which occurred on May 14th and again on May 28th. Although the leaves were not injured, the injury to the blossom was soon apparent in the blackening and drying up of the pistils or centre of the flower. Fruit trees in bloom at the same time were not injured, probably owing to the warmer temperature of the atmosphere at a somewhat higher altitude.

An old strawberry bed which had already fruited for three years was allowed to fruit again this year, and very clearly showed the folly of leaving old beds for so long a time. Another lot that had borne only one crop yielded a fair crop again this year. The new bed set out last fall was not allowed to fruit, the blossoms being picked off. This has made excellent growth and promises well for next year. The plants have been covered this fall with a mulch of coarse strawy manure, which will be raked off and left between the rows in the spring. This protects the plants from the alternate freezing and thawing in the early spring, and helps to retain the usually much needed moisture later on in the season.

Arboretum and Tree Clumps.

In 1890 a collection of forest trees consisting of several varieties of maples, English and American ash, elms, oak, hickory, butternut, walnut, birch, basswood, mountain ash and catalpa, also several varieties of conifers such as larch, spruce and pine, was planted on four acres of a hillside in field No. 4, facing the College. With the exception of the catalpas (*Catalpa bignonioides*), which are too tender for this section, nearly all have made a very good growth. They are planted in rows eight feet apart each way, and are kept well cultivated and trimmed. The different varieties of evergreens and deciduous trees are irregularly grouped so as to present, when viewed from a distance, a very pleasing appearance.

In 1887 three acres of a similar plantation was put out in field No. 3. These trees have made a rapid growth and are now so large that cultivation is difficult, and is in fact almost unnecessary as the trees make such a dense shade that grass or weeds cannot well grow under them.

This plantation serves a good purpose in screening from view a large gravelly knoll and a couple of gravel pits, and presents instead a varied mass of light and dark green foliage.

A clump of European larch in field No. 2, much nearer the College, answers a similar purpose. These trees were set out in 1881, and have long since become so large that cultivation has been stopped and the trees left to take care of themselves.

The clump of walnut trees in the experimental field at the back of the College was put out at the same time. These have been kept well cultivated and have made a good growth. Many of the trees are now six or eight inches in diameter, and will in time become valuable for timber.

In 1890 and 1891 two hundred and forty young elms were planted along the sides of the farm lane. These have, on the whole, made a very unsatisfactory growth, some much worse than others. On examination early in the spring it was found that forty of them were badly infested with the flat-headed borer (*Chrysobothris femorata*), and later on in the season all were found to be more or less affected with a fungus (supposed to be that described as *Dothidella ulmea*), which blights the leaves and young twigs, causing the latter to become brittle and flattened in portions where it is readily broken off with the wind. With the aid of a knife and a bit of wire all of the borers that could be found were dug out and destroyed, and early in June the trunks of all the trees were washed with a solution of soft soap and carbolic acid to prevent the beetles depositing their eggs on any of the other trees. The fungus was discovered too late in the season to be treated. Next year we hope to be able to take this in time and try upon it the efficacy of the copper sulphate solution and Bordeaux mixture.

III. FRUIT EXPERIMENT STATIONS.

The Need of Such Stations.

One of the most progressive movements during the year along horticultural lines has been the establishing of a number of fruit experiment stations in different parts of the province.

For a number of years the fruit growers of Ontario have felt the need of some means whereby the different varieties of fruits, both old and new, could be properly tested and their relative merits for different sections of the country made known to the public. To try and meet this need various schemes have been proposed; but until this year none have appeared practical enough to meet the approval of the Department of Agriculture and receive the desired support from the Government.

Plan of Organization.

The plan at last adopted provides for the establishment of ten experiment stations located in different parts of the province, so as to meet as far as possible the varied conditions of location and climate. Instead of purchasing land for each station a successful fruit grower is selected, who has already under cultivation a good orchard or plantation, containing a number of varieties of the particular fruit or fruits to which he is to give special attention in testing. He is supplied from time to time with whatever additional varieties are thought necessary to be tested. The complete results of such tests are to be reported at the end of the season to the Secretary of the Fruit Growers' Association, and the Horticulturist at the Ontario Agricultural College, this work being under the joint control of the Agricultural College and the Fruit Growers' Association.

To compensate him for his trouble each experimenter is to receive a sum of money sufficient to repay him for his extra labor in connection with this work.

This plan meeting the approval of the Government, an appropriation of $1,000 was made at the last session of the Legislature for commencing the work.

A Board of Control, representing the Agricultural College and the Fruit Growers' Association, was appointed as follows :

James Mills, M.A., LL.D., O.A.C., Guelph, President.

L. Woolverton, M.A., Grimsby, Secretary.

H. L. Hutt, B.S.A., O. A. C., Guelph.

A. M. Smith, St. Catharines.

A. H. Pettit, Grimsby.

*D. Nicol, Cataraqui.

The first meeting of the Board of Control was held at the College, April 4th, 1894, when the work of organization was completed and five stations decided upon.

Stations Established.

After some considerable correspondence four stations were established as follows :

1. At Leamington, Essex County, under W. W. Hillborn, for peaches and strawberries.
2. At Craighurst, Simcoe County, under G. C. Caston, for apples.
3. At Winona, Wentworth County, under Murray Pettit, for grapes.
4. At Trenton, Bay of Quinte district, under W. H. Dempsey, for apples and pears.

Each of these men is a thorough-going, practical fruit grower, and has under cultivation a large number of varieties of those fruits to which he is to give special attention in testing. Last spring they were supplied with a number of additional varieties which it was thought advisable to test.

Inspection of the Stations.

In company with Mr. L. Woolverton, Secretary of the Fruit Growers' Association, it was my pleasant duty during the summer to make a tour of inspection to each of the stations This we did, visiting each station at the most opportune time for gaining information relative to the various kinds of fruit grown there. In every case we were pleased to be able to report that good work was being done, and that in time valuable results may be expected.

Reports of Experimenters.

Early in the season Mr. Woolverton and I met and drafted blank forms on which to record systematically all the information that may be desired as to the planting, cultivation, management, bearing, etc., of each variety grown at each station. Other forms were also drafted on which to record all the desired particulars as to the origin and description of both plant and fruit of each variety. These forms were printed and forwarded to each experimenter to be filled out from careful notes taken during the season. At the close of the season valuable reports have been received from each station. These are too voluminous to be published here, but will be published in full, together with full particulars as to the organization and establishment of the stations, in a separate report now in course of preparation by the Secretary of the Board of Control.

Other Stations to be Established.

The original plan provides for the establishing of ten stations. The object being as far as possible to spread the work so as to meet the requirements of all sections of the country, and at the same time confirm by a number of reports the results obtained.

*Deceased.

The establishment of other stations will depend upon two things: First, the granting by the Legislature of a larger appropriation for carrying on the work. This we have no doubt will be forthcoming at the next session, as the desirability of the results and the success attained so far in obtaining them will warrant a doubling of the grant next year. Second, suitable men in suitable localities must be found for carrying on the work. This is a matter that requires careful consideration, as the success of the work depends largely upon the capability of the men chosen as experimenters. With this object in view Mr. Woolverton and I have visited several sections where it was thought advisable that stations should be established. One of these is the Beaver Valley, in Grey county, which has proved itself peculiarly adapted to plum growing. Here it is thought that Mr. John Mitchell, of Clarksburg, a very successful plum grower, would be a suitable man for conducting experimental work. Mr. Mitchell's appointment as an experimenter will be recommended at the next meeting of the Board of Control. This and one or two other stations, it is hoped, will be established during the coming season.

All of which is respectfully submitted,

W. L. HUTT,
Horticulturist.

ONTARIO AGRICULTURAL COLLEGE,
GUELPH, Dec. 31, 1894.

PART VI.

REPORT OF THE AGRICULTURIST.

To the President of the Ontario Agricultural College:

Sir,—I have the honor to submit herewith my second annual report. My work during the past year has followed closely the plan outlined in my last year's report, special pains being taken to make the work as practical as possible. With this object in view, special attention has been given to the handling and judging of live stock, including cattle, sheep, and swine.

Lectures have also been given on the construction and arrangement of farm buildings, in which the College barns and stables have been used as object lessons: their faults criticized, and improvements suggested.

Besides lectures in live stock, the students have received a course in general agriculture; and an effort has been made to adapt the subject to the capacity of the students, the practical being given prominence with the beginner, and the scientific and more theoretical, reserved for the more advanced.

During July, a short series of lectures on agriculture was given before the public school teachers who took advantage of the summer course. The lectures were given with the object of outlining what might be taught in the public schools, and of briefly indicating the method in which it might be presented.

During the past year, nothing has been done in experimental feeding. I trust that during the coming year we shall be able to commence a number of valuable experiments with cattle, sheep and hogs.

At present our buildings are not well adapted to experimental feeding. With a small outlay, the building which was erected a few years ago as an extra sheep pen, and which is very little used at present, could be converted into a convenient building for experimental cattle and sheep. An experimental piggery is also needed, and a building which would answer the purpose could be erected at a small cost. If such arrangements can be made, we shall be well equipped for carrying on this highly important work.

Your obedient servant,

G. E. DAY,

Lecturer on Agriculture.

Guelph, December 29th, 1894.

PART VII.

REPORT OF FARM SUPERINTENDENT.

To the President of the Ontario Agricultural College:

Sir,—I have the honor of herewith submitting my report of the Farm Department for the year 1894.

Notwithstanding the very dry season, all the crops on the farm were excellent. The grain crop, however, not being all threshed, I am unable to give the exact number of bushels of each variety to the acre. Following is a summary of the work done during the year:

Messrs. Lamb and Stephen have charge of the cattle, sheep and pigs. In winter they are allowed three students one hour in the morning, from 5 a.m. to 6 a.m., to assist in feeding; and two students in the afternoon to prepare food, groom cattle, etc.

Feeding and Care of Live Stock.

Cattle: In winter the cattle are fed as follows: a mixture composed of cut hay, chaff, ensilage, and pulped roots. None of the breeding stock except the milch cows, receive any grain. The milch cows are given every day about three pounds of crushed grain and bran. The feeding steers, seventeen in number, weighing at present (December) nearly 1,200 pounds each, are receiving the same allowance as the milch cows. An increase of grain will be given in the spring.

In summer the breeding stock are turned out to pasture, and towards fall when the pasture becomes dry, corn and rape are hauled to the fields for the cattle, sheep and pigs.

In summer the cattle are each week rubbed over with seal oil and crude carbolic acid, one tablespoonful of the latter to one quart of the former. This prevents the horn fly and other insects from annoying them. The oil is applied with the sponge, and care is taken not to miss any part of the animal.

Sheep: In winter, the breeding sheep are fed as follows: in the morning they are fed the same mixture as the cattle; at noon, pea straw; and in the evening, clover hay. After lambing, the ewes receive in addition a little grain and roots. In summer, they are on pasture without grain.

Pigs: The pigs number at present, 12 full-grown for breeding and 28 young animals. The average age of the latter is two months. The food used is the refuse of the College, cooked and mixed with 58 lb. of bran and middlings of equal quantities. The cost per day for bran and middlings 40c., refuse from college equal to 3 bushels of roots 24c. total 64c. Cost of food per day for each animal 1.6c.

Last summer we had roots to cook for pigs continuously. The sugar beets until the 1st of August, at which time we commenced using mangels from the field, boiling both tops and roots.

The following live stock is kept for educational purposes:

8	breeds of	cattle, 1	male and	2	females	of	each	breed.
9	"	sheep, 1	"	6	"	"	"	
5	"	swine, 1	"	2	"	"	"	

Horses: The following are the winter rations: In the morning, (5 o'clock) the same as milch cows, viz., a mixture of cut hay, chaff, ensilage and pulped roots, with 2 lb. of crushed hay and bran; at noon, 3 lb. cut hay with 2 lb. grain; in the evening, carrots and cut hay only.

When spring work begins, they are fed cut hay and 5 lb. of crushed grain and bran each, three times per day—morning, noon and night.

In the winter season Mr. Benson and the students perform all the work on the farm, viz., threshing, cutting feed, crushing grain, pulping roots, cutting up fallen trees, and clearing up the wood land; also hauling and spreading manure for next season's hoe crops, hauling ice for College and dairy. Students drive the teams and perform the work on the farm in turns.

Permanent Improvements Made During the Year.

A new 4-foot sidewalk was constructed on the public road from College to the limit of city of Guelph. Mr. McIntosh, of the mechanical department, had charge of this, the work being performed by the students.

The public road running southwest from Brock Road was graded and gravelled for 100 rods within the past month. The gravel was taken from the hill opposite No. 3 field. Most of it was very coarse, but this difficulty was overcome by carefully spreading and having a foundation six or seven feet in width paved with the large stones (from 3 to 5 inches in size) in the centre of the road-bed. This was carefully covered with fine gravel and sand. It is the intention to keep all loose stones raked into the ruts and rolled frequently.

Fences: Many of the fences were in a very dilapidated condition, causing considerable annoyance with neighboring cattle getting into the crops. There have been constructed nearly three miles of new fence this season, of the following design: round 6-inch cedar posts, 20 feet apart, 3½ feet in the ground, seven wires, each 2 strands of No. 12 twisted, the top wire barbed, spaced as follows from the bottom,—5, 6, 6, 8, 9, 9, inches. The intention is to stay the horizontal wires with upright rods or wires. 90 rods have been stayed with No. 14 wire, 2 feet apart. This is put firmly and neatly around each horizontal wire and fastened top and bottom. One person can stay from 20 to 30 rods per day, according to the distance stays are put apart. No. 7 steel rods fastened to the horizontal wires with washers are a better support for the top and bottom wires, but as the cost is more than five times that of No. 14 wire, it is a question which to adopt.

The cost of fence complete: wire 22c., posts 10c. per rod; the labor of digging the holes, setting the posts, etc., was performed by the students, with the exception of one man. The labor may be estimated at 10c. per rod. Total cost without stays 42c. per rod. Cost of staying with No. 14 wire, 2½ feet apart, 5c. per rod; with No. 7 steel rods and washers, 2½ feet apart, 28c. per rod. The above makes a very neat, durable and cheap fence.

Underdraining: 600 rods of underdraining was done on the farm this spring. I understand two unsuccessful attempts have been made to drain the pond in No. 14 field. With the spirit level it was found that it could be drained by connecting with an 8 inch drain in No. 1 field. The contract was let to Henry Prange, of Breslau, at 50c. per rod for digging and laying tiles through No. 13 field, 60 rods, which were put down from 5 to 7 feet deep; main drains and laterals in No. 14 field were put down 2½ to 3 feet deep, price 25c. per rod, 6-inch tile were used the first 60 rods, balance of main drain 5 and 4-inch and the laterals 3 inches. There is now no dryer land on the farm.

No. 12 field was sown with oats the 27th of April. During the wet weather in May about five acres of this field was covered with water, although it was closely tile drained; but they were too shallow and had not a proper out-let. With the spirit level, it was found that a few inches of fall could be got by connecting with a 6-inch drain in No. 10 field. The fall is only ½ inch to the rod. 5 and 4-inch tile were used in the main drain and 3-inch for laterals. They are working nicely, and although a portion of the oats was covered with water in the spring, at harvest they were a fair crop.

Rotation of Crops.

As no system or rotation of crops has been practised on this farm for years past some of the fields are greatly in need of a change from grain to grass and *vice versa.* It is the intention to adopt the four years' course system, as follows: 1st and 2nd years, grass, (meadow and pasture); 3rd year, hoe crops, viz.: roots, potatoes, corn and peas; 4th year, wheat, oats and barley, seeded in spring with grass seed, principally common red clover. With fields Nos. 19 and 21, which are nearly a mile from the barns, it is the intention to follow a three years' course for convenience and to increase fertility without manure, 1st and 2nd years, grass; 3rd year grain and re-seeded with grass, (principally clover.)

Field Crops.

Field No. 1, 20 acres: Pasture for dairy cows; about 8 acres was cut for hay.

Field No. 2, 17 acres: 9 acres rye, a very heavy crop; the balance of 8 acres, Poland White oats, sown April 18th and harvested August 1st, a good average crop. This field was seeded with grass on April 18th, the following mixture: 6 lb. red clover, 3 lb. alsike, 4 lb. timothy, and 2 lb. perennial rye grass.

Field No. 3, 16 acres: Mandscheuri barley, sown (drilled) April 17th and 18th, and harvested 19th and 20th July; more than an average crop; seeded with grass seed, same mixture as No. 2.

Fields 4 and 5, 24 acres: Pasture for sheep and dairy cows. This is fall plowed for peas next spring.

Field No. 6, 20 acres of Prussian Blue peas, sown 25th and 26th of April, and harvested the first week in August. A good average crop; not threshed yet.

Field No. 7, 20 acres of Siberian oats, sown 23rd and 24th of April, and harvested 8th and 9th of August. More than an average crop; not threshed yet.

Field No. 8, 20 acres: 17 acres of Danebrog oats and 3 acres of tall white Marrowfat peas. Harvested peas 27th and 28th July; oats, 6th and 7th of August.

Field No. 9, 20 acres of meadow: a very heavy crop.

Field No. 10, 14 acres: 8 acres corn (Salzer's North Dakota), sown 30th and 31st of May; about 2 acres cut green and fed to dairy cows, and balance put in silo 26th and 27th of September. Yield, 15 tons per acre. Balance 6 acres potatoes, Crown Jewel, Pearl of Savoy, Empire State, and Rural New Yorker No. 2. 1½ acres of each. Harvested 18th-20th of October. Total yield 900 bushels.

Field No. 11, 20 acres of meadow, principally lucerne clover; a heavy crop.

Field No. 12, 17 acres of improved Besthorn oats: not threshed yet; only a moderate crop. This field required underdraining, which was done in June.

Field No. 13, 15 acres: 12 acres of Oderbrucher barley, sown 19th and 20th of April and harvested 21st and 22nd of July. A medium crop; not threshed yet. 3 acres Kennakulla barley, sown 20th of April and harvested 27th July. Average crop; not thrashed yet.

Field No. 14, 23 acres: 6 acres of mangels, of following varieties: Long Red, Yellow Intermediate, Yellow Globe, and Golden Tankard; 1½ acres of each variety; sown 1st and 2nd of May; harvested 10th-12th October. 2,500 bushels.

Sugar beets, green top and red top, 1½ acres each. Sown 3rd of May and harvested October 15th. Yield 1,100 bushels.

Carrots, White Intermediate, ½ acre. Sown 5th May and harvested October 25th. Yield 325 bushels.

Swede turnips, 4½ acres, Bronze Top, Rennie's Prize, and Carter's Prize Taker. Sown 21st of June, and harvested October 26th and 27th. Yielding 2,800 bushels.

9 acres of rape, 4½ acres sown 21st of June, which yielded abundantly. As soon as ready for use, a portion was cut each day and hauled to the pasture fields to feed to the cattle, sheep, and pigs. Second sowing 4½ acres; sown 18th and 19th of July. This lasted until Christmas.

Field No. 15, 24 acres of permanent pasture. Seeded 15 years ago.

Field No. 16, 20 acres of ensilage corn: Mammoth Cuban and Learning, sown 29th and 30th of May and put into silo September 17th-26th. Yield 15 tons per acre.

Field No. 19, 30 acres: 17 acres spring wheat, 3 varieties, Herrison Bearded, Pringle's Champion, and Blue Stem. Sown 16th and 17th of April. Harvested 1st-3rd of August; good average crop.

13 acres fall wheat, 4 varieties, Dawson's Golden Chaff, American Bronze, Golden Drop and Bulgarian. The first named yielded 35 bushels per acre, the others about 30 bushels. This field is seeded with the same grasses as Nos. 2, 3, 12 and 13.

Field No. 21; 12 acres of meadow (lucerne clover). Plowed end of July, and sown with fall wheat August 31st and September 1st—3 varieties, Early Genesee Giant, Dawson's Golden Chaff, and American Bronze.

Spring Seeding.

All land intended for spring seeding was thoroughly cultivated and plowed the previous fall. The land is prepared in spring as follows: first harrowed, then cultivated with a spring tooth cultivator, again harrowed, and then the grain drilled in. Finally it is harrowed and rolled, and at the same time all stones are picked.

Fall Plowing and Cultivation.

Field No. 1: Grass land, intended for roots next season. It was plowed the last week in September, afterwards twice harrowed. Middle of October cultivated with broad share cultivator. Again harrowed, and finally manured with well-rotted barnyard manure, 20 loads to the acre. This will lie on the surface until planting time in the spring, when it will be gang-plowed.

Fields Nos. 6, 7, and 8 were gang-plowed as soon as grain was harvested, then twice harrowed, cultivated with broad share cultivator, again harrowed, and finally plowed.

Annual Sale.

The annual sale of surplus live stock was held October 3rd, on the farm. Notwithstanding a heavy rain during the forenoon, there was a good number of buyers. The following animals were sold: 7 young cattle, $242.00; 48 sheep, $510.00; 48 pigs, $700.00; total, $1,452.00.

Farm Accounts.

I beg to suggest that a separate account be kept for the farm. At present the thirty cows belonging to the dairy department are pastured in summer and supplied with hay, ensilage and roots in the winter from the farm, without the farm having credit. The four horses for the experimental department, two for garden, and two for College are fed by the farm department and no credit allowed. By this means accurate data as to the management of the farm and its financial results would be secured.

Respectfully yours,

WM. RENNIE,
Farm Superintendent.

Ontario Agricultural College,
Guelph, Dec. 31, 1894.

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 work conducted in the experimental department during the year 1894. During the past year there has been progress made in connection with the experimental work of the Agricultural College. The experimental grounds have been extended, the number of plots has been increased, several new and prominent varieties of grain and roots have been imported, and the number of packages of seeds and fertilizers distributed to the farmers throughout Ontario has increased considerably. Although the season has been unfavorable for some of the kinds of farm crops, still, on the whole, we have a greater number of successful experiments to report than in any previous year. In fact the number of failures has been but few. I wish to draw your attention to the great need of an experimental building, that we may be better enabled to carry on the work in the experimental department.

The Experimental Grounds.

The experimental grounds now cover an area of about forty acres. During the past year they have all been in one compact block, instead of forming parts of some three or four different fields as in former years. This is an improvement, as the work in connection with the experimental department is greatly facilitated in not having the plots distributed over different sections of the farm. The fields which were formerly known as number 17 and number 18 have been joined together. These form the present experimental grounds. These have been divided into plots which numbered over 1,700, during the present year. The plots vary from $\frac{1}{12}$ to $\frac{1}{300}$ of an acre in size. The plots are mostly laid out in ranges four rods wide and eighty rods long. A road, one rod wide, is left between each two ranges and also along the ends of the ranges The driveway, which passes between the chemical laboratory and the main college building, is continued northward running through the experimental field and dividing the ranges into two equal parts. This driveway is about 24 feet in width and 85 rods in length. It can be clearly seen that the whole system of plots is very compactly and systematically arranged These various roads allow easy access to all plots, either for the object of harvesting the crops or for visitors to drive through and examine the different varieties which are being tested. There are in all about five miles of road throughout the experimental grounds.

Equipment for Agricultural Experiments.

We are now getting fairly well equipped for the work of conducting experiments on the field plots. Several implements have been constructed in such a way that they are well fitted for careful experimental work. For instance, a grain drill has been made which will sow ten different varieties of grain at one time without mixing. The tubes are exactly one link apart, and all the grain left in the drill can be completely removed from it in a very short space of time. A wagon rack has been made by which the crop of two plots can be drawn from the field to the threshing barn without the varieties becoming mixed, and without the loss of any of the grain on account of its becoming shelled. A large scale, which will weigh from one quarter of a pound to three tons, is placed in the loft of the experimental barn, and the product of the plots is weighed as soon as harvested. A small separator called the "Little Giant," made by John Abell, Toronto, has been reconstructed in such a way that it can be thoroughly cleaned out after each plot is threshed. This machine is run by a tread power and both are situated in the experimental barn.

During the busy season of harvest, when there are about 400 different plots of grain all ripening in a few weeks time, it is absolutely necessary to carry on several operations simultaneously, such as cutting, hauling, weighing, threshing and cleaning the products of the various plots. The "Little Giant" separator is, therefore, in operation from morning till night during nearly every day from the commencement until the close of the harvest.

The Experimental Department in its Relation to the Farm Proper.

These two departments are quite distinct, but at the same time one department very frequently receives advice and assistance from the other. During the early part of the year, the farm proper cut the timber and plowed for the first time several acres of new land, lying at the east corner of the experimental grounds. After this was accomplished the experimental department brought a man from Hamilton, who blasted nearly all of the stumps with dynamite.

The grounds have been again plowed and levelled and about 20 plots of winter wheat have been sown in one portion. The dynamite generally removed the entire stump and the roots immediately underneath the stump, leaving, of course, many of the lateral roots, which can be removed from the land without a very great deal of labor. We expect to have all this new land divided into experimental plots in a short time.

All the varieties of grain, potatoes, roots and corn which were grown in the farm department during the past year were those varieties which had made the best records in the trial grounds. In most instances they had been tested from three to five years. Some of them were varieties which had been secured in this province, while others were originally imported by the experimental department from France, Germany, Russia, Italy and other foreign countries.

The Experimental Department in Relation to the System of Co-operative Experiments in Agriculture Conducted by the Farmers of Ontario.

The Ontario Agricultural and Experimental Union, which is an association composed of officers, students and ex-students of the Agricultural College, has been in existence for the past sixteen years. At first, the principal work of the association was to meet annually at the College and hold a two days' meeting, during which time addresses on agricultural subjects were delivered and discussed.

In 1886, a committee was appointed to consider the best plan of carrying forward co-operative experiments in Agriculture. During that year there were twelve experimenters. From that day up to the present, the work has gradually and substantially developed, until during the present year no less than 1,340 farmers throughout this province were engaged in conducting these co-operative experiments. The seeds and fertilizers are sent out from the experimental department each year, and the Experimental Union pays part of the expense for distribution. The summary results of all the successful tests are presented annually at the meeting of the association. Much interest and enthusiasm has been manifested in this work, and we believe that great good is being accomplished in many ways, and the experimental department feels well paid for the time and labor devoted to this very important feature of experimental work in Ontario. It is a strong connecting link between the farming community and the Agricultural College.

Exhibits.

During the past six years, the experimental department has had an exhibit at one or more exhibitions. In 1889, 1890, 1891 and 1892, an exhibit was placed at the leading exhibitions of Ontario, among which Toronto and London might be mentioned. In 1893, the experimental department placed an exhibit at the World's Columbian Exhibition, which is described in the College Report of last year. During the present year, we prepared an exhibit for the Central Exhibition held in Guelph, during the third week in September. The exhibit consisted of grain in jars and in head, of roots, and of corn. The leading varieties of grain were shown, and the specimens of mangels, carrots, turnips, sugar beets and kohl rabi were the largest on the exhibition grounds. The following short description of the exhibit was published in one of the Guelph newspapers :

THE ONTARIO AGRICULTURAL COLLEGE EXHIBIT.

"Mr. C. A. Zavitz, Experimentalist at the Ontario Agricultural College, has a very tastily arranged collection of grain in head and straw, and roots, at the north end of the horticultural building upstairs, and is constantly surrounded by a crowd of sightseers in quest of the information he is always ready to give. His carrots, mangels and turnips are the largest in the show, while the sugar beets, used for feeding purposes, are fine specimens. A most interesting feature are the wheats which have led in the experiments of the College and the Agricultural Union for the past two or three years. Dawson's Golden Chaff has given the best results, and is becoming a great favorite. The American Bronze and Standard wheats are also shown, among many others."

Correspondence.

The correspondence in connection with the experimental work is increasing year by year, and is becoming very heavy. During the present year, we have received as high as seventy nine letters in one day, and an average of about forty letters a day for several weeks at different seasons of the year. Some of these were reports of experiment ; but in very many cases questions were asked regarding a great variety of subjects connected with agricultural work.

Visitors to the Experimental Department.

Thousands of farmers visited the institution during the month of June, and nearly all examined the experimental grounds as well as they could in their very limited stay at the College. At that season of the year the plots present a very good appearance ; but as the crops are yet so small, but little information can be gleaned regarding the leading varieties. The winter wheats, however, are so far advanced that many important points can be gleaned regarding the characteristics of the different varieties. The crops on the root, potato, and corn sections of the experimental grounds are exceedingly small in the month of June, and the Swede turnips and rape plants have not yet made their appearance. A good general outline, however, of the experimental work can be gleaned even from a short visit through the experimental grounds during the month of June, and we believe that a greater interest is created in regard to the operations of the experimental department. They can observe the extent of the work and the careful and systematic manner in which it is conducted, and thus will likely take a deeper interest in reading the reports of the results when issued.

There are many visitors who come to the institution during the months of July and August, at which season of the year the plots are in the most favorable condition for inspection. Some persons spend a considerable amount of time in examining the various crops, and comparing one variety or one system of cultivation with another. It is in this way that the visitor can reap the greatest advantage by a trip through the experimental field. It would take several days for a person to examine closely all the crops under experiment.

Experiments in Grain Growing.

The plots devoted to the grain experiments varied from $\frac{1}{150}$ to $\frac{1}{12}$ of an acre in size. The plots used for nearly all the grain experiments were exactly 100 links long and ten links wide, thus being $\frac{1}{100}$ of an acre in area. Experiments were conducted with varieties, dates of seeding, methods of seeding, selection of seed, different quantities of seed per acre, grain cut at different stages of maturity, spring barley sown in the autumn to form a mulch for wheat in winter, and with grain sown in mixtures.

Variety Tests with Grain.

During the past six years all the Ontario varieties of grain which could be obtained have been grown on the experimental plots. Besides the Ontario grains, varieties were imported from Germany, Italy, Sweden, Russia, England, Scotland, Switzerland, Hungary, Greece, Sicily, Egypt, Japan, New Zealand, Australia, and the United States. All the 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 have 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 23,000 packages of choice seed have been sent out over the province during the past four years, and some of the varieties are being grown quite extensively. Nearly the whole of the grain grown on the fields in the farm department during 1893 were varieties which were first grown on 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 grown in larger plots, all the varieties are grown in single rows with 100 grains in each row. The rows are one rod long and one foot apart. This gives a grand opportunity to confirm the results of the same varieties on 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 differing slightly in character, a much better opportunity is afforded to determine which variety is most affected by rust, which variety possesses the strongest straw, etc. From the single rows the collection is made for exhibition purposes. The land where the single rows are grown, is treated similarily to that of the larger plots. By making the exhibition collection from this source, the plots are left entirely undisturbed, and, as the greatest accuracy is practised in our plot work, the results may be considered to be of a very reliable nature.

The rainfall in the month of May was exceedingly heavy, surpassing that for the same month for several years previous; during March, June, July, and September it was about average; and during April and August exceptionally light. The temperature from April to September in 1894, was slightly higher than for the ten years previous.

FIELD PLOT EXPERIMENTS.

Barley, Comparative Test of 50 Varieties.

Fifty varieties of barley were grown in 1894. Of this number twenty-six were two-rowed, fourteen six-rowed, and ten hulless varieties. Among thirty-seven kinds, which were grown on the experimental plots for five successive years previous to 1894, only eleven of the leading kinds were sown in the spring of the present year. There were, therefore twenty-six varieties discarded after five years' trial. Fourteen varieties were grown for four years, three for three years, nine for two years, and three for one year. They were all sown broadcast at the rate of 100 lb. per acre, upon plots exactly 1-100 of an acre in size. Equal amounts of grain were sown upon the different plots Seeding took place on April 24th. The land was a mild clay loam, was manured at the rate of fifteen tons per acre of farmyard manure in the spring of 1893, and produced a crop of potatoes that season. The yields per acre have been estimated from the actual yields of the plot.

BARLEY, COMPARATIVE TEST OF 40 TWO-ROWED AND SIX-ROWED VARIETIES.

Varieties.	Seed obtained from—	No. of rows per head.	Results for 1894. Date of maturity.	Weight per measured bushel.	Straw per acre.	Grain per acre.	Average results for number of years grown on plots. Weight per measured bushel.	Straw per acre.	Grain per acre.
Grown for six years:			July.	lb.	tons.	bush.	lb.	tons.	bush.
1 Mandscheuri	Russia	6	23	51.06	1.96	85.02	50.76	1.79	**61.42**
2 Oderbrucker	Germany	6	22	52.38	1.89	75.27	53.65	1.59	**55.38**
3 Scotch Improved	Ontario	6	20	50.25	1.73	71.48	51.63	1.50	**54.50**
4 French Chevalier	France	2	29	51.88	2.53	65.23	51.98	1.90	**54.04**
5 Empress	England	2	31	52.63	1.91	59.90	52.27	1.89	**51.82**
6 Common Six-Rowed	Ontario	6	20	49.25	1.70	64.58	52.29	1.42	**51.35**
7 Improved Cheyne	England	2	29	50.63	2.57	55.27	52.27	2 00	**50.21**
8 Thanet	"	2	30	50.56	1.93	53.13	52.18	1.82	**49.44**
9 Early Black	France	6	28	49.38	1.34	56.77	50.23	1.47	**49.21**
10 Kinna Kulla	Sweden	2	30	52.19	1.71	53.65	51.62	1.78	**47.94**
11 Two Rowed Italian	France	2	31	53.06	2.39	40.10	52.68	2.01	**47.85**
Grown for five years:									
12 Cape	New Zealand	6	26	47.81	1.66	70.31	47.32	1 40	**54.06**
13 Mensury	Ontario	6	19	49.13	1.74	66.94	51.11	1.38	**52.11**
14 New Zealand Chevalier	New Zealand	2	29	52.63	2.13	59.38	52.77	1.96	**51.48**
15 Early Minting	England	2	29	52.44	1.92	55.33	52.17	1.91	**51.39**
16 Italian	Italy	2	28	52.88	1.71	57.81	54.26	1.83	**50.76**
17 Australian	Germany	2	29	55.25	1.75	47.92	52.89	1.79	**50.70**
18 Diamond	"	2	29	52.19	1.70	43.75	51.96	1.56	**42.51**
19 Very Early Lapland	Russia	2	18	48.69	1.49	50.52	47.74	1.20	**41.78**
Grown for four years:									
20 California Brewing	United States	6	26	48.44	1.51	62.25	46.16	1.49	**58.84**
21 Imperial Six-Rowed	Ontario	6	19	51.19	1.53	61.21	51.95	1.49	**57.68**
22 Martin West	United States	2	23	54.19	2.27	69.92	54.27	1.72	**52.58**
23 Six-Rowed Baxter's Improved	Ontario	6	21	51.00	1.55	52.08	51.83	1.48	**52.02**
24 California Chevalier	United States	2	28	51.50	2.13	53.00	51.58	1.94	**51.20**
25 Highland Chief	"	2	28	53.50	1.73	50.79	52.30	1.73	**50.95**
26 Duckbill	Ontario	2	29	53.56	1.58	46.88	52.32	1.69	**50.72**
27 Carter's Prize Prolific	England	2	28	52.63	2.20	52.21	52.53	1.86	**49.58**
28 Salzer's California Prolific	United States	2	28	52.94	1.58	44.40	52.46	1.66	**48.53**
29 Carter's Goldthorpe	England	2	30	52.13	2.63	46.48	51.66	1.91	**47.17**
Grown for three years:									
30 Gold Foil Hansfords	United States	2	27	52.38	2.30	60.29	51.99	2.01	**47.63**
31 Two-Rowed Canadian	Ontario	2	26	52.25	1.87	53.40	52.15	1.64	**42.67**
32 Selected Canadian Thorpe	"	2	26	52.06	2.10	54.17	51.22	1.65	**40.72**
Grown for two years:									
33 Four-Rowed	United States	6	19	50.19	1.55	58.33	51.55	1.35	**51.72**
34 Black	"	2	23	50.75	1.73	57.04	51.38	1.52	**48.72**
35 Vermont Champion	"	2	22	51.63	2.10	50.13	53.32	1.78	**48.32**
36 Jarman's Selected Beardless	England	2	28	52 31	......	58.73	50 31	....	**43.32**
37 Jarman's Golden Champion	"	2	28	51.31	2.26	49.48	49.61	1.67	**35.49**
Grown for one year:									
38 Scotch	United States	6	21	49.38	1.71	56.00	49 38	1 71	**56 00**
39 North Western	"	......	21	49 06	1.62	44.92	49.06	1.62	**44.92**
40 Success	"	6	18	47.63	1.45	39.71	47.63	1.45	**39.71**

The barley crop gave an average of 56.3 bushels of grain per acre in 1894, which was 15 bushels per acre more than the average of all the varieties grown in 1893. This was somewhat above the average of the past six years, which shows a yield of 49.7 bushels of grain per acre. The average yield of straw in 1894 was 1.88 tons, while the average for the past six years was 1.68 tons. The weight per measured bushel, however, in 1894 was only 51.4 lb., while in 1893 it was 52.1 lb. 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. The reader's attention is specially drawn to the column at the right hand side which gives the average yields of the varieties for the number of years which they have been grown.

Varieties discarded: After growing 37 varieties of barley side by side for five years in succession, previous to 1894, 26 varieties of this number were dropped from the experiment during the present year, and only eleven of the leading kinds have been tested this season. The varieties discarded were as follows: German Golden Drop, Improved Golden Melon, Selected Chevalier, Kalina, Hallett's Pedigree, Improved Beardless, Peerless White, Phoenix, Imperial, English Golden Drop, English Malting, Improved Imperial, Probsteier, Cheyne, Golden Melon, Invel, Beardless, Carter's Prize Prolific, Pfauen, Two-Rowed Spreading, Scotch Chevalier, Annats, Scholey's Chevalier, Italian Rice, Emperor and Dutch.

Comparison of six rowed and two-rowed varieties: In 1894 the six-rowed varieties gave an average of about ten bushels per acre more than the average of the two-rowed varieties under experiment. In regard to the weight per measured bushel and straw per acre, however, the opposite to this took place, as the two-rowed varieties gave an average of $2\frac{1}{2}$ lb. more per measured bushel and one-third of a ton of straw more per acre than the average of the six-rowed barleys. All the varieties, which gave the largest average yield per acre during the past year were six-rowed barleys, and those which gave the largest yield of straw per acre, and the greatest weight per measured bushel were all two-rowed varieties. The two-rowed varieties have made a poor record in 1894 as compared with the six-rowed barleys.

Leading varieties in 1894: The five varieties which gave the largest average yield per acre were as follows: Mandscheuri 85 bushels, Oderbrucker 85.3, Scotch Improved 71.5, Cape 70 3 and Martin West 69.9.

The five varieties which gave the heaviest weight per measured bushel were as follows: Australian 55.3 lb., Martin West 54.2, Highland Chief 53.5, Two-Rowed Italian 53.1 and Duckbill 53.6.

The five varieties which gave the largest yield of straw per acre were: French Chevalier 2.5 tons, Improved Cheyne 2.6, Carter's Goldthorpe 2.6, Two-Rowed Italian 2.4, and Gold Foil Hansford's 2.3.

The five varieties which were the earliest to reach maturity were, Success, Very Early Lapland, Mensury, Imperial Six-Rowed and Four-Rowed.

The five varieties which gave the largest average number of grains per head were Scotch Improved, Common Six-Rowed, Mensury, Cape and California Brewing.

Yields of 10 Varieties of Hulless Barley.

Ten varieties of hulless barley have been grown on the trial plots during the past two years, and six of the number for five years in succession. These barleys have been obtained from different countries, namely, Hungary, Sweden, France, Australia, Germany, United States and Ontario. Only one of the ten varieties was obtained in this province, namely, Black Hulless. The standard weight per measured bushel of the hulless varieties would, of course, be 60 pounds. The ten varieties gave an average of 61.6 pounds per measured bushel during 1894. This is one half pound greater than the average of the past six years. The average yield of grain per acre in 1894 was 36.5 bushels, while that of the past five years was 35.2. The Hungarian variety, which was imported from Hungary in 1889, and which made a fine record for three years, has not done quite so well during 1893 and 1894. The Black Hulless gave the largest yield per acre of the ten varieties tested during the past season; but, as the straw of this variety is exceedingly weak it is apt to do very poorly in unfavorable seasons. The Hungarian variety possesses a straw which is stiffer than that of nearly all of the other hulless varieties.

Varieties.	Seeds obtained from—	Number of rows per head.	Results for 1894.				Average results for number of years grown on plots.		
			Date of maturity.	Weight per measured bushel.	Straw per acre.	Grain per acre.	Weight per measured bushel.	Straw per acre.	Grain per acre.
			July.	lb.	tons.	bush.	lb.	tons.	bush.
Grown for five years :									
1 Hungarian	Hungary	6	22	57.75	1.70	35.10	59.23	1.56	39.18
2 Black Hulless	Ontario	6	23	63.94	1.49	43.65	63.59	1.57	38.57
3 Guymalaya..................	Sweden	6	23	57.88	1.45	34.90	58.30	1.22	36.66
4 Large Skinned	France	2	20	60.06	1.77	37.72	60.01	1.45	29.78
5 Skinless....................	Australia	6	17	62.06	1.13	33.85	61.05	1.04	26.45
6 Three-Rowed..........	Germany	6	24	62.88	1.25	31.77	60.50	1.15	24.83
Grown for two years :									
7 Purple	United States	6	23	65.13	1.38	42.50	63.52	1.74	41.70
8 Guy Mayle........	"	6	22	63.06	1.08	37.50	62.78	1.12	40.35
9 Winnipeg No. 2	"	6	22	60.94	1.33	34.17	60.42	1.56	37.89
10 Smooth Hulless.............	"	6	23	62.50	1.67	34.27	62.25	1.57	36.84

Peas, Comparative Test of 46 Varieties.

There were 46 varieties of peas grown in the experimental department during 1894. Seventeen of these varieties have been grown side by side for four years, seventeen for three years, and three for one year. As the peas which were sown in 1891 did not germinate evenly, the results for that year were never published. The varieties numbered 1, 2, 3, 4, 5, 6, 7, 8, 10 and 11 were all sown on April 24th, and the remainder on April 25th.

The grain was sown with a grain drill which contained ten tubes, the tubes being one link (7.92 inches) apart. The quantity of grain sown varied from two to five bushels per acre, according to size of the grain, and the manner of growth of the various kinds. As the varieties of peas and barley were sown in alternate plots to prevent the peas from mixing, the soil would, of course, be very similar in both cases. The plots were each one-hundredth of an acre in size. The yields per acre have been estimated from the actual results from the plots.

The average yield per acre of the 46 varieties of peas grown in 1894 was 27.8 bushels. This was about one bushel per acre less than the average for the past four years. The weight per measured bushel, however, was a little heavier during the past season than the average since 1890, which was 60.8 lb.

The Early Britain pea, which stands at the head of the list in yield per acre among seventeen varieties grown for four years, was only surpassed this year by the White Wonder, which was imported from New Zealand in the spring of 1889. The Early Britain has a purple blossom and a brown colored pea, and is one which is making a good record for itself.

The Mummy and the Prussian Blue, both Ontario varieties, stand very close in yield of grain per acre, and take the lead of all the Ontario kinds which have been grown for four years.

The Tall White Marrowfat heads the list among seventeen kinds grown for three years with an average of 35.5 bushels per acre, and an average weight of 61.2 lb. per measured bushel. It is a large white pea, and one which has done well in the trial grounds.

Comparative Test of 46 Varieties of Peas.

Varieties.	Date of maturity.	Results for 1894. Weight per measured bushel.	Results for 1894. Straw per acre.	Results for 1894. Grain per acre.	Average results for number of years grown on plots. Weight per measured bushel.	Average results. Straw per acre.	Average results. Grain per acre.
Grown for four years :		lb.	tons.	bush.	lb.	tons.	bush.
1 Early Britain	Aug. 2	61.03	1.66	39.95	59.88	1.27	37.14
2 White Wonder	" 1	63.88	1.25	41.77	62.77	1.09	35.94
3 Mummy	" 2	64.00	1.50	38.38	63.48	1.53	34.72
4 Prussian Blue	" 6	62.00	1.28	30.73	62.30	1.33	34.23
5 Field (New Zealand)	July 31	62.06	1.46	36.47	62.69	1.27	33.72
6 Brown (New Zealand)	Aug. 3	60.75	1.51	36.47	59.29	1.55	33.57
7 Princess Royal	July 31	60.88	1.33	30.73	60.07	1.21	32.06
8 Black-Eyed Marrowfat	Aug. 1	61.50	1.40	29.90	61.35	1.43	31.70
9 Blue (New Zealand)	" 4	62.06	1.46	32.92	61.94	1.21	30.73
10 White-Eyed Marrowfat	" 1	62.56	1.65	26.77	61.92	1.43	30.69
11 Early Racehorse	July 29	61.75	1.37	29.27	62.91	1.24	30.04
12 Multipliers	Aug. 3	62.50	1.45	25.00	61.83	1.56	28.83
13 Sweet Jessie	July 27	62.13	1.39	36.88	62.26	1.09	28.20
14 Selected Maple	" 19	60.81	.82	34.38	62.30	.69	26.90
15 Glory	Aug. 2	61.75	1.21	31.25	61.04	1.24	26.41
16 Perfection White	" 1	60.13	1.08	25.83	59.73	1.21	24.98
17 Hero of Reading	July 28	60.13	.99	26.88	60.11	1.10	24.72
Grown for three years :							
18 Fall White Marrowfat	Aug. 1	61.69	1.77	35.88	61.16	1.74	35.56
19 Canada Cluster	" 1	63.19	1.28	30.73	62.00	1.67	33.78
20 New Canadian Beauty	July 30	62.00	1.13	24.17	61.87	1.41	31.92
21 Golden Vine	Aug. 1	63.63	1.33	27.45	61.94	1.56	31.68
22 Cleveland's Advancer	" 4	60.25	1.35	31.67	60.35	1.39	31.56
23 Centennial	" 2	62.31	.44	22.08	61.10	1.23	30.89
24 McLean's Advancer	July 30	54.88	1.08	27.30	53.89	.97	29.97
25 Scotchman	Aug. 8	64.06	1.37	22.72	62.62	1.83	29.91
26 Royal Dwarf Marrowfat	" 1	61.38	1.62	24.48	60.39	1.53	29.89
27 Early June	" 1	63.56	1.33	22.30	62.59	1.43	29.77
28 Prince Albert	" 5	62.50	1.40	26.57	61.77	1.50	25.86
29 Sword	" 2	63.75	1.52	22.82	62.05	1.39	25.54
30 Canada Field	" 2	61.88	1.32	26.15	61.03	1.33	24.65
31 Potter	" 1	61.94	1.34	27.08	60.98	1.18	23.49
32 Oakshott Field Pea	" 9	54.56	1.44	18.65	53.52	1.38	20.55
33 Pride of the North	" 4	60.13	.89	20.22	58.58	1.02	19.94
34 Striped Wisconsin Blue	" 6	63.56	1.19	16.88	62.52	1.26	18.43
Grown for two years :							
35 Egyptian	Aug. 6	57.19	.97	29.48	59.25	1.05	32.64
36 Chancellor	July 22	64.13	1.23	29.17	63.32	1.36	31.54
37 Common Grey	" 29	58.25	1.49	28.65	58.25	1.27	30.68
38 William the First	" 23	58.13	1.00	26.57	59.47	1.00	29.89
39 Nine Pod	" 30	58.56	1.36	24.80	58.43	1.34	28.90
40 Nimble Taylor	" 30	58.13	1.18	25.63	58.32	1.19	28.42
41 D'Auvergne	" 21	62.19	.90	23.33	61.25	1.03	25.62
42 Fall Turkish	" 21	61.88	1.56	24.68	60.59	1.26	24.79
43 White Imperial	Aug. 2	61.63	.72	15.93	61.47	1.03	23.12
Grown for one year :							
44 Crown	July 29	61.25	1.56	26.25	61.25	1.56	26.25
45 Improved Grey	" 29	61.25	.95	23.43	61.25	.95	23.43
46 Coffee	Aug. 1	61.25	1.23	19.17	61.25	1.23	19.17

The Canada Cluster is very similar in every respect to the Mummy. The Egyptian is a pea differing very materially from all of the other varieties grown. The stems are quite upright in growth and branch out in the form of a tree. The seed of this variety was brought from Egypt a few years ago.

It is a very exceptional thing to find more than one pea in a pod, and the grain is large and plump. There are a great many buds on each plant. It is a late maturing variety, and the straw, which does not grow more than about one foot high, is not equal to the straw of the other varieties. The Egyptian pea is worthy of further experiments to determine its true value in connection with agriculture.

Varieties discarded. A number of varieties which had been grown previous to 1894 were not grown during the present year ; the reasons being that some of them were inferior in many respects, and that others were better adapted to garden than to field cultivation. The varieties which were dropped from the list were as follows : Veitch's Perfection, Earliest of all Blue, Champion of England, Early Maple, Sexton's Alpha, Telephone, Sugar, Philadelphia Extra Early, Tom Thumb, Prince of Wales, Cleveland's Rural New Yorker, Cleveland's Alaska, Telegraph, British Queen, McLean's Little Gem, Stratagem, Anticipation, Yorkshire Hero, Blue Peter, American Wonder, Laxton's Supreme, French Canner, Laxton's Prolific Long Pod, Bruce's Early Conqueror, Kentish Invicta, Bliss Everbearing, Ne Plus Ultra, New Giant Podded Marrow, Carter's Lightning, Tall Turkish, Carter's First Crop, Long Island Mammoth, Laxton's Evolution, Carter's Nimble White, Dwarf Sugar Edible Podded, Hair's Dwarf Blue Mammoth and Partridge.

Leading varieties of 1894. The six varieties which gave the largest average yield of grain per acre were as follows: White Wonder (New Zealand) 41.9 bushels, Early Britain (England) 40.0, Mummy (Ontario) 38.4, Sweet Jessie (England) 36.9, Field (New Zealand) 36 5, and Brown (New Zealand) 36 5.

The five varieties which gave the heaviest weight per measured bushel were as follows: Chancellor 64.1, Scotchman 64.1, Mummy 64.0, White Wonder 63.9, and Sword 63.8.

The six varieties which gave the largest yield of straw per acre were: Tall white Marrowfat 1.8 tons, Early Britain 1.7, White-Eyed Marrowfat 1.7, Royal Dwarf Marrowfat 1.6, Tall Turkish 1.6, and Crown 1.6.

The three varieties which were the earliest to reach maturity were: Selected Maple, D'Auvergne, and Tall Turkish ; and the two varieties which were the latest, were the Grass and Oakshott Field Pea.

The two varieties which possessed the longest pods were the Pride of the North and New Zealand Brown, and those which had the shortest pods were the Grass and the Egyptian.

The three varieties which gave the largest average number of peas per pod were the Sword, Golden Vine, and D'Auvergne.

Spring Wheat, Comparative Test of 62 Varieties.

In 1893, 62 varieties of spring wheat were grown side by side on the experimental plots. Besides varieties which were obtained from over Ontario, there were some which were imported by this farm within the last six years from Germany, Russia, France, England Greece, Italy, Sicily, etc Of the 62 varieties which were tested this season, nine were grown for six years in succession, twenty-one for five years, nine for four years, eight for three years, ten for two years, and five were grown upon the experimental plots in 1894 for the first time.

The varieties were all grown on land which was quite similar in quality throughout, being what might be termed a mild clay loam. The soil used for the spring wheat was in close proximity to that used for the barley and the peas. The grain was sown broadcast, and at the rate of 120 lb. per acre. The plots were exactly 1-100 of an acre in size in every instance. The land had been manured in the spring of 1893 with suitable manure at the rate of 15 tons per acre, and a crop of corn was grown on the land during that season. The seeding of all the varieties took place on April 19th. The yields per acre have been estimated from the actual yields given from the plots.

Varieties.	Nature of head.	Results for 1894.			Average results for number of years grown on plots.		
		Weight per measured bushel.	Yield of straw per acre.	Yield of grain per acre.	Weight per measured bushel.	Yield of straw per acre.	Yield of grain per acre.
Grown for six years:		lb.	tons.	bushels.	lb.	tons.	bushels.
1 Herison Bearded	Bearded	64.44	2.21	41.25	63.32	2.04	**29.29**
2 Bart Tremenia	"	63.94	1.94	40.22	62.82	1·74	**27.37**
3 Pringle's Champion	"	61.38	2.13	37.18	60.56	1.94	**26.95**
4 Saxonka	"	61.75	2.28	40.52	60.54	1.80	**25.17**
5 Konisburg	"	61.25	1.94	33.75	61.63	1.66	**24.29**
6 Holben's Improved	Bald	60.19	2.23	35.52	58.78	1.87	**24.25**
7 Summer	Bearded	58.00	2.27	30.93	57.83	1.80	**23.16**
8 Ordinary Bearded March	"	57.25	2.50	30.00	57.88	1.83	**22.58**
9 Odessa Ghirka	Bald	59.13	2.33	25.73	59.61	1.89	**22.54**
Grown for five years:							
10 Red Fern	Bearded	63.06	2.58	38.97	61.57	2.20	**33.39**
11 Wild Goose	"	60.50	2.18	47.18	60.98	1.96	**31.92**
12 White Russian	Bald	60.19	2.32	39.27	59.24	1.98	**31.53**
13 Red Fyfe	"	61.00	2.19	37.08	60.04	1.88	**27.74**
14 White Fyfe	"	61.06	2.27	34.38	61.73	1.65	**26.88**
15 Medeah	Bearded	61.13	2.49	40.42	60.95	1.62	**26.64**
16 Sorentina	"	60.63	2.11	34.68	59.73	1.70	**25.58**
17 Mountain	Bald	59.94	2.84	37.08	58.79	1.93	**25.34**
18 Colorado	Bearded	60.75	2.47	30.93	60.15	1.77	**24.91**
19 Algiers	"	60.06	2.27	36.05	58.17	1.81	**24.89**
20 Kubanka	"	62.19	2.48	35.63	....	....	**24.33**
21 Grecian	"	61.50	2.06	31.25	58.22	1.77	**23.61**
22 Triumph	Bald	56.63	2.24	25.22	58.53	1.73	**22.64**
23 Atalank	Bearded	58.19	1.94	23.75	57.64	1.59	**20.43**
24 Ladoga	"	54.19	1.80	19.85	56.44	1.40	**20.37**
25 Paros	"	57.06	2.26	22.92	56.69	1.65	**18.98**
26 Neapel	"	49.94	2.39	18.65	52.79	1.76	**17.57**
27 Voto	"	56.50	2.20	21.77	56.58	1.64	**14.91**
28 March White	Bald	56.13	1.95	18.23	56.11	....	**12.93**
29 Square Head	"	51.50	2.21	18.02	53.26	1.64	**11.28**
30 African	"	58.63	1.69	11.98	....	1.22	**6.40**
Grown for four years:							
31 McCarlin	Bearded	58.56	2.15	28.38	59.19	2.19	**27.80**
32 Okanagan Valley Velvet Chaff	Bald	59.06	2.12	32.82	54.42	1.88	**27.63**
33 Rio Grande	Bearded	58.31	2.07	25.93	59.35	1.94	**27.33**
34 Manitoulin	Bald	60.88	2.15	33.28	59.92	1.74	**27.15**
35 Saskatchewan Red Fyfe	"	60.38	1.98	32.40	59.72	1.77	**26.40**
36 Salzer's Assiniboia Fyfe	"	60.50	2.09	31.93	59.15	1.57	**25.46**
37 Washington	Bearded	60.13	2.24	30.42	59.58	1.69	**24.63**
38 Pringle's Defiance	Bald	57.94	1.74	23.55	58.51	1.49	**21.04**
39 Anglo-Canadian	Bearded	52.63	2.03	17.50	54.03	1.63	**17.58**
Grown for three years:							
40 Wellman Fyfe	Bald	59.63	2.09	35.32	58.94	2.16	**30.77**
41 Lost Nation	"	59.69	2.08	35.52	59.43	2.16	**30.57**
42 Velvet Chaff Blue Stem	"	59.38	2.33	33.85	58.39	1.98	**28.82**
43 Hayne's Blue Stem	"	58.81	2.08	30.52	58.00	1.89	**26.97**
44 New York	Bearded	60.63	2.16	36.35	59.08	1.85	**26.78**
45 Manitoba Red	Bald	60.50	2.19	33.55	59.43	1.93	**26.18**
46 Dakota Marvel	"	59.25	2.18	30.73	57.35	1.86	**23.31**
47 Campbell's White Chaff	"	57.19	1.88	25.83	54.20	1.56	**17.08**

SPRING WHEAT, COMPARATIVE TEST OF 62 VARIETIES.—*Continued.*

Varieties.	Nature of head.	Results for 1894. Weight per measured bushel.	Results for 1894. Yield of straw per acre.	Results for 1894. Yield of grain per acre.	Average results for number of years grown on plots. Weight per measured bushel.	Average results. Yield of straw per acre.	Average results. Yield of grain per acre.
Grown for two years:		lb.	tons.	bushels.	lb.	tons.	bushels.
48 Blue Democrat	Bearded	60.94	2.46	34.80	59.47	2.08	25.75
49 Amythest	Bald	61.38	2.06	31.47	59.09	1.68	23.84
50 Champion Bearded	Bearded	61.00	2.35	31.67	58.75	1.98	23.29
51 Early Scotch Bearded	"	58.13	2.16	28.02	57.97	1.78	21.86
52 French Imperial	Bald	61.19	2.07	32.60	58.85	1.59	21.80
53 Ontario	Bearded	59.00	2.10	26.67	57.65	1.65	20.14
54 Canadian Club	Bald	58.50	1.97	26.05	56.75	......	18.13
55 Scotch Fyfe	"	61.00	1.88	29.17	58.65	1.39	17.64
56 Niagara	"	56.19	2.03	22.18	52.70	1.52	13.79
57 White Australian	"	51.06	1.93	13.97	49.28	2.62	9.39
Grown for one year:							
58 Salzer's Marvel	Bald	59.06	1.99	31.98	59.06	1.99	31.98
59 Cubana	"	59.06	2.07	31.05	59.06	2.07	31.05
60 Pillsburg	"	59.31	1.66	27.92	59.31	1.66	27.92
61 May's Early Wonder	"	60.63	1.93	27.40	60.63	1.93	27.40
62 Red North Dakota	"	59.25	1.55	26.67	59.25	1.55	26.67

The spring wheat crop of 1894 was even superior to that of 1893, as in the case of the former the average yield was 30.3 bushels of grain per acre, and of the latter 21.1 bushels per acre. This, however, is partly accounted for by our having discarded thirteen poor varieties in 1894, which were grown the year previous. The average weight of grain per measured bushel during the last year was 59.2 pounds, while the average weight per measured bushel for all the varieties during the past six years, was 58.5 pounds. In 1893 it was only 56.5. The straw of the past year was slightly over two tons per acre, which is indeed high.

The Herison Bearded, which was imported from France in 1889, still heads the list in yield of grain per acre among all the varieties which have been grown for the past six years. Not only is this true in regard to the yield of grain, but it is also true in regard to the average weight per measured bushel, which is 63.3 pounds. The Bart Tremenia which was imported from Greece in 1889, comes next to the Herison Bearded in average yield of grain per acre, also in weight per measured bushel. It is however, a much coarser wheat than the Herison Bearded. The Pringle's Champion which was imported from Germany, stands third in average yield of grain, and is a variety which the millers have pronounced as being a first-class milling wheat. The yield of this variety in 1894 was about four bushels per acre less than that of the Herison Bearded. The Red Fern is a variety well known over Ontario, and has taken the lead of all the Ontario varieties in the experimental department. The Wild Goose is at the head of the list of all the varieties of spring wheat during 1893 and 1894. This, however, is a very coarse wheat and will not bring as much on the market as some of the other varieties of a finer quality. The Wellman Fyfe, which was obtained in the United States three years ago is a promising variety; it possesses a velvety chaff, is stiff in the straw, and is very free from rust.

Varieties discarded. After growing twenty-two varieties of spring wheat during the years of 1889, 1890, 1891, 1892 and 1893, the thirteen poorest varieties were discarded and only the nine which had given the best results were sown in the spring of 1894. The thirteen varieties which were discarded are the following: Dantzic, Nenhert, King Bartigen, Bearded Red, April Bearded Red, Red Bearded March, Ordinary March, March Debrie, French Summer, Chidham White, Large Flag, Hickling's March White and Lonzella White.

Prominent varieties in 1894. The five varieties which gave the largest average yield of grain per acre were as follows: Wild Goose (Ontario) 47.2 bushels per acre, Herison Bearded (France) 41.3, Saxonka (Russia) 40.5, Bart Tremenia (Greece) 40.2, Medeah (Africa) 40.4.

The five varieties which gave the heaviest weight per measured bushel were as follows: Herison Bearded 64.4 pounds, Bart Tremenia 63.9, Red Fern (Ontario) 63.1, Kubanka (Russia) 62.2 pounds, and Saxonka 61.8.

The six varieties which gave the longest straw were: Wild Goose (Ontario), Red Fern, Red Fyfe, White Fyfe, Sorentino. Each of which was from 51 to 53 inches in height.

The eight varieties first to mature were: March White, Herison Bearded, Colorado, Ladoga, Square Head, African, Early Scotch and Cubana.

Winter Wheat, Comparative Test of 80 Canadian and American Varieties.

The following report upon 80 varieties of Canadian and American winter wheat was issued in August as Bulletin No. XCVII.:

There were 178 plots used for the winter wheat experiments in 1894, these being divided off as follows: Variety tests, 102 plots; dates of seeding, 36; methods of seeding, 12; selection of seed, 8; quantity of seed per acre, 6; sowing spring grain to act as a mulch for wheat, 4; and harvesting at different stages of maturity, 10. As the variety tests have been conducted for five years in succession and the rest of the experiments for only one or two years, this bulletin treats more particularly of the varieties grown than of the methods of cultivation.

Conditions of soil. The field upon which the grain was grown is a good average clay loam, quite uniform in character, and has a gradual slope towards the northeast. The size of all the plots used was $\frac{1}{100}$ of an acre, with the exception of those for different dates of seeding, in which case it was $\frac{1}{120}$ of an acre. The yields per acre have been calculated from the actual results of the plots. The land was prepared on the bare fallow system, and received a dressing of fifteen tons of farmyard manure per acre in the summer of 1893. No other fertilizer was used. Four crops had been removed from the land since it had received farmyard manure previous to last year.

Conditions of season and growth. Seeding took place early in September, and during that month 1.3 inches of rain fell, which was slightly below the average of the four years previous. The growth of the wheat in the autumn was good, and the amount killed out during the winter and early spring was small. April proved to be a very dry month, and May one of exceptionally wet weather; the growth of the wheat, however, was quite good throughout. The ripening of the grain took place between the 15th and the 23rd of July, which was fully three days earlier than in any of the four previous years. The trouble from both rust and smut was not serious this season.

Soon after the grain headed out, a storm caused the weak-strawed varieties to become considerably lodged, which interfered with the proper filling of the heads. To determine the effect produced by the lodging of the crop, an examination was made of four varieties, which were partly lodged about five weeks before the ripening season. From each of these varieties 1,000 heads were collected out of the standing grain, and also 1,000 heads out of the lodged portion of the crop. The sheaves were threshed separately and the results recorded, the following being the summary :

Condition of crop.	Weight of grain from 4,000 heads.	Weight of 4,000 kernels of grain.
	ozs.	drs.
Standing	121¼	82
Lodged	67	73

Providing the plants which lodged were equal in every respect to those which did not lodge, these results go to show that the loss to the grain through lodging was about 4.5 per cent. in yield and 11 per cent. in quality.

Varieties. This bulletin gives the particulars of 80 varieties of winter wheat grown in 1894 upon plots exactly similar in size and situated side by side. Paths three feet wide were left between the plots. Seeding took place on September 2nd with all the varieties excepting Nos. 56, 58 and 65, which were sown three days later, and No. 54, which was sown seven days later. The grain was sown by hand at the rate of 2 bushels per acre, and the land was then harrowed. The average yield in 1894 was superior to that of 1890, 1892 or 1893, but was not equal to that of 1891.

The following table gives the average results of the winter wheat tests for each of the past five years :

Year.	Number of varieties grown.	Average weight of grain per measured bushel.	Average yield of straw per acre.	Average yield of grain per acre. (bu.=60 lb.)
		lb.	tons.	bush.
1890	15	60.0	2.4	30.9
1891	23	63.3	2.0	52.9
1892	44	60.5	3.2	42.6
1893	52	58.4	2.1	29.9
1894	80	60.8	4.0	46.7

It will be noticed that the yield of straw per acre in 1894 was double that of 1891, and yet the yield of grain for 1891 was the highest of the five years. The order of the yield per acre for the five years is the same as that of the weight per measured bushel.

The result of the 80 varieties of winter wheat grown in 1894 are placed in tabulated form in such a way that the reader can compare the different kinds very easily. Starting at the left hand side of the table, columns 1 and 2 give the numbers and names of all the varieties ; 2 and 3 refer to their characteristics ; 5, 6, 7, 8 and 9 give the results for 1894, and 10, 11 and 12 give average results for the number of years the varieties have been grown in the experimental department The varieties are arranged in the order of their average yield per acre for the number of years grown, as indicated by the last column in the table, to which the reader's attention is especially directed. The great advantage of having the results of *all* the varieties here recorded is that any farmer may be enabled to compare the varieties with which he is not familiar with those which have been grown by himself or by his neighbors.

Characteristics and yields of eighty varieties of winter wheat:

Varieties.	Nature of head.	Color of grain.	Results for 1894. Date of maturity.	Per cent. of straw lodged.	Weight per measured bushel.	Straw per acre.	Grain per acre.	Average results for number of years grown. Weight per measured bushel.	Straw per acre.	Grain per acre.
Grown for five years:			July		lb.	tons.	bush.	lb.	tons.	bush.
1 Early Red Clawson	Bald ...	Red....	18	77	58.9	4.9	55.3	59.0	3.2	46.5
2 Surprise..................	“	White..	20	35	59.2	3.7	48.3	59.8	2.9	46.0
3 Golden Drop	“	Red....	20	72	62.9	4.4	49.3	61.9	3.1	44.0
4 Red Velvet Chaff	“	“	22	62	58.0	5.1	49.3	59.5	3.2	42.8
5 Bonnell or Landreth........	“	White..	19	37	59.4	4.5	53.2	59.7	3.1	42.6
6 Standard	“	“ ..	18	7	59.9	3.7	58.3	59.2	2.8	42.3
7 Golden Cross or Volunteer..	Bearded	Red....	23	77	59.4	5.2	40.5	60.5	3.1	41.6
8 Rogers	Bald ..	“	23	67	59.4	5.0	43.0	60.4	3.1	41.5
9 Seneca or Clawson..........	“	White..	19	55	59.7	4.3	53.0	59.6	3.0	41.0
10 Manchester	“	Red....	19	57	61.1	4.7	46.5	61.1	2.9	40.9
11 Martin Amber.....	“	White..	24	57	60.9	4.4	49.1	60.6	3.0	40.6
12 Hybrid Mediterranean.	Bearded	Red....	21	67	61.1	4.8	39.1	61.2	3.2	40.3
13 Lancaster	“	“	19	92	60.7	4.8	42.5	61.7	3.2	39.1
14 Red Lion	“	“	16	95	62.0	4.9	42.4	61.4	3.2	38.8
15 New Monarch	Bald ...	“	17	60	61.1	4.1	44.9	60.2	2.8	35.5
Grown for four years:										
16 American Bronze	Bald ...	Red....	17	0	61.3	3.7	52.7	59.7	3.1	48.4
17 Egyptian	Bearded	“	17	55	61.5	3.6	54.2	61.4	2.9	48.3
18 Jones' Winter Fyfe	Bald ..	“	17	7	61.0	3.9	59.6	60.6	2.6	47.4
19 Bulgarian	Bearded	White..	17	42	62.0	3.9	53.9	62.3	2.7	45.6
20 Canadian Velvet Chaff......	Bald ...	“ .	19	4	59.1	3.5	57.0	58.4	2.7	45.4
21 Garfield or Natural Cross ..	“	“ ..	21	4	61.6	3.3	57.6	60.0	2.7	45.3
22 White Pearl................	“	“ ..	21	2	62.1	3.3	52.8	60.8	2.7	43.7
23 Democrat	Bearded	“ ..	17	27	62.3	2.7	49.5	62.1	2.7	41.9
Grown for three years:										
24 Dawson's Golden Chaff......	Bald ...	White..	18	8	61.1	4.1	65.2	59.3	3.3	51.5
25 Reliable	Bearded	Red...	17	50	62.4	4.2	52.5	61.6	3.1	44.0
26 Russian Amber	“	“	17	50	61.5	3.6	53.3	61.2	2.9	43.0
27 Walker's Reliable	“	“	18	50	62.3	4.4	53.6	60.8	3.1	42.6
28 Valley	“	“	16	32	61.9	4.2	55.6	60.7	2.9	41.8
29 Rumsey....................	“	White..	19	45	61.0	4.2	46.0	60.7	3.1	39.5
30 Rutherford	“	Red....	21	50	61.1	4.9	42.1	59.7	3.5	39.1
31 Fultz	Bald ...	“	18	11	63.8	2.8	48.7	62.4	2.4	38.7
32 Genesee	Bearded	White..	19	30	60.9	3.8	48.8	60.2	2.9	38.2
33 Mediterranean..............	“	Red....	18	50	62.5	4.2	33.1	61.8	3.5	38.1
34 Hybrid Diehl	Bald ...	White..	19	16	61.3	3.7	51.1	59.0	2.6	37.8
35 Monette....	“	Red....	19	25	60.2	3.7	46.3	59.1	2.9	37.0
36 Manilla....................	“	White..	20	11	59.3	3.6	49.4	57.3	2.9	36.7
37 Longberry Red	Bearded	Red....	18	92	60.4	4.2	41.0	60.5	3.1	36.5
38 Velvet Chaff	“	“	16	0	63.6	3.0	40.5	62.4	2.5	35.7
39 Red Wonder..........	“	“	21	50	61.1	4.8	31.3	61.7	3.6	35.3
40 Deitz Longberry............	“	“	20	16	62.2	3.2	25.2	61.9	2.8	34.7
41 Fulcaster	“	“	19	47	60.8	4.8	29.4	62.2	3.2	34.4
42 Scott	Bald ..	“	19	42	60.1	3.4	44.6	59.6	2.5	33.3
43 Red Russian	“	“	21	0	61.9	2.8	40.3	59.8	2.3	29.9
Grown for two years:										
44 Early White Leader	Bald ...	White..	22	15	57.9	3.6	57.2	56.2	2.7	43.6
45 South Sea	“	“ ..	20	7	60.3	3.4	50.1	60.2	2.3	40.6
46 Soules.....................	“	“ ..	17	20	57.8	4.5	52.5	55.9	3.2	39.4
47 Eureka	“	“ ..	17	17	58.1	3.6	47.2	57.1	2.7	37.4
48 Stewart's Champion	“	Red....	18	15	59.1	4.0	47.3	57.5	3.2	36.6
49 White Star	Bearded	“	19	20	60.1	4.0	44.5	59.5	2.5	34.8
50 Treadwell	“	White..	17	20	61.1	3.6	47.9	59.1	2.4	32.2
51 British Columbia	Bald ...	Red....	22	0	58.6	3.2	45.8	55.9	2.4	30.4

Characteristics and yields of eighty varieties of winter wheat.—*Continued.*

Varieties.	Nature of head.	Color of grain.	Results for 1894. Date of maturity.	Per cent. of straw lodged.	Weight per measured bushel.	Straw per acre.	Grain per acre.	Average results for number of years grown. Weight per measured bushel.	Straw per acre.	Grain per acre.
Grown for one year :			July		lb.	tons.	bush.	lb.	tons.	bush.
52 Early Genesee Giant........	Bearded	White..	19	15	60.9	4.0	56.9	60.9	4.0	56.9
53 Early Ripe	Bald ...	Red ...	21	42	61.5	4.2	55.1	61.5	4.2	55.1
54 Pride of Genesee............	Bearded	"	19	40	60.5	3.8	51.4	60.5	3.8	51.4
55 Poole	Bald ...	" ..	16	42	61.6	4.0	50.7	61.6	4.0	50.7
56 New Columbia	" ...	"	16	15	58.2	4.0	50.1	58.2	4.0	50.1
57 Siberian....................	" ...	"	23	35	62.9	4.1	49.6	62.9	4.1	49.6
58 Rudy	Bearded	"	23	77	59.6	3.8	48.9	59.3	3.8	48.9
59 Red May	Bald ...	"	17	20	62 5	4.0	48.4	62.5	4.0	48.4
60 Jones' Square Head	"	White..	19	0	60.3	3.2	48.3	60.6	3.2	48.3
61 Arnold's Hybrid............	Bearded	Red....	16	22	62.2	3.9	48.2	62.2	3.9	48.2
62 Tasmania Red..............	"	"	19	85	61.9	4.4	47.1	61.9	4 3	47.1
63 Turkish Red	"	"	17	40	62.3	3.6	46.6	62.3	3.6	46.6
64 McPherson	Bald ...	"	18	30	61.9	3.9	45.1	61.9	3.9	45.1
65 Kentucky Giant............	Bearded	"	16	70	58.4	3.9	45.1	58.4	3.9	45.1
66 Tuscan Island..............	"	"	17	65	59.8	3.9	44.8	59.8	3.9	44.8
67 Hindostan	"	"	21	45	61.5	4.0	44.5	61.5	4.0	44.5
68 Zimmerman	Bald ...	"	18	2	63 0	2.9	44.3	63.0	2.9	44.3
69 Egyptian Amber	Bearded	"	18	65	60.3	4.5	44.0	60.3	4.5	44.0
70 Imperial Amber	"	"	21	90	59.0	4.9	43.4	59.0	4.9	43.4
71 Andrew's No. 4	"	"	22	47	60.0	4.5	41.4	60.0	4.5	41.4
72 Emporium	Bald ...	"	23	45	58.0	3.9	41.2	58.0	3.9	41.2
73 Penquit's Velvet Chaff......	Bearded	"	19	2	62.1	3.6	40.4	62.1	3.6	40.4
74 Geneva	"	"	17	67	61.6	4.1	40.1	61.6	4.1	40.1
75 Bissell	"	"	15	72	60.8	4.0	40.0	60.8	4.0	40.0
76 Simcoe Red	"	"	17	60	57.0	4.3	38.3	57.0	4.3	38.3
77 Currell	Bald ...	"	16	40	61.5	4.2	37.2	61.5	4.2	37.2
78 Currell's Prolific	"	"	16	50	61.5	4.3	36.7	61.5	4.3	36.7
79 Bullard's Velvet Chaff......	"	"	23	0	62.9	2.3	31.6	62.9	2.3	31.6
80 Golden Tankard............	"	"	17	92	59.4	5.2	31.5	59.4	5.2	31.5

The following remarks are made upon the varieties which have given the largest yields of grain per acre for the number of years they have been grown on the plots.

Early Red Clawson. This variety gave the largest average yield of grain per acre, and also the lowest average of grain per measured bushel among fifteen varieties grown for five years. The crop is much inclined to lodge in unfavorable seasons, but when it stands well, the bald heads, red chaff and white straw give this variety an attractive appearance when seen standing in the field. It will be remembered that the Early Red Clawson stood third in average yield per acre in the co-operative experiments over Ontario for 1893, at which time eleven varieties were tested.

American Bronze. The special feature of the American Bronze is that the crop usually stands well, while that of many other varieties becomes badly lodged. It is also a good yielder, and the average weight of grain per measured bushel for five years is nearly up to the standard. The chaff and straw are white, the heads bald, and the grains large, fairly long, and of an amber color. Among the 80 varieties of winter wheat grown on plots in 1894, the American Bronze was one of the finest looking at the time of harvest. I may add that this variety is somewhat subject to rust in unfavorable seasons.

Dawson's Golden Chaff. In yield of grain per acre, the Dawson's Golden Chaff takes the lead among all the varieties that have been tested at this station. In 1894 it gave 18.5 bushels per acre more than the average of the eighty varieties grown and 5.6 bushels more than the variety which stood next below it in yield. This wheat has been grown on the plots for three years, and leads in yield of grain among the forty three varieties grown for that length of time. In the co-operative experiments over Ontario in 1893, when eleven varieties of winter wheat were tested, the Dawson's Golden Chaff not only gave the largest average yield of grain in the sixty experiments, but also headed the list in thirty-five out of sixty of the individual experiments In three years' trials at the experiment station, the Dawson's Golden Chaff stands exactly equal with the American Bronze in strength of straw, these two being the stiffest strawed varieties. The average weight of grain per measured bushel for the Dawson's Golden Chaff during three years is 59.3 lb, which is also exactly the same as the average of the fifteen varieties of white wheat grown for the same length of time. This variety is apt to rust in some seasons; but it has been quite free from smut at this place although some trouble with smut in this variety is reported from one or two of the localities where it is now grown. The Dawson's Golden Chaff is quite distinct from any of the other varieties grown, and when ripe most closely resembles the Standard and the Clawson (white) varieties. The straw is medium in length and the crop has a golden appearance. In 1894 it was grown on eleven plots in the experimental department, and on about four acres in the farm department; and was unanimously pronounced the most attractive variety at this station by five judges who examined the standing grain.

Early White Leader. Although this variety gave the largest average yield of grain for two years, among eight varieties grown on the plots in 1893 for the first time, the weight of the grain per measured bushel was the third lowest, among eighty varieties grown this season. It possesses long straw; long, bald heads; white chaff; and white grain of medium size.

Early Genesee Giant. This variety has been grown on the plots for two years, but owing to the lateness of receiving the seed in 1892 the results were not reported the first year. It stood fourth in general appearance of standing grain, and seventh in yield of threshed grain, among eighty varieties grown this year. The straw is tall and fairly strong, the heads bearded and quite compact, the chaff red and the grain white.

The above mentioned varieties have all been offered by leading seedsmen over Ontario for at least two years, with the exception of the Dawson's Golden Chaff which was not advertised in the seedsmen's catalogues previous to this season. In 1881 Mr. Robert Dawson, of Paris, Ont., had a field of the Seneca, or Clawson in which he found one plant quite distinct and much superior to the rest of the crop. Mr. Dawson sowed the grain from this plant, and has continued to grow this wheat since that time. This variety has been extensively grown in the vicinity of Paris for the past few years; but it was practically unknown over Ontario until tested at the experimental station along with many old and new varieties, and the comparative results published.

The following table gives the average results of white and red wheats grown side by side for five years in succession:

Years.	Average results of white wheats.				Average results of red wheats.			
	Number of varieties.	Weight per measured bushel.	Straw per acre.	Grain per acre.	Number of varieties.	Weight per measured bushel.	Straw per acre.	Grain per acre.
		lb.	tons.	bush.		lb.	tons.	bush.
1890	5	60.1	2.3	30.3	10	59.9	2.5	31.2
1891	10	62.7	2.1	55.9	13	63.7	1.9	50.7
1892	15	59.6	3.2	40.0	29	61.1	3.2	44.0
1893	20	57.4	2.0	29.6	32	59.0	2.2	30 2
1894	22	60.3	3.8	52.4	58	60.9	4.1	44.5
Average	....	60.0	2.7	41.6	....	60 9	2.8	40.1

In the above summary no separate classification was made for the amber, bronze and golden shades of color which are sometimes applied to winter wheat. These were included with the red wheats. The white wheats gave an average of $1\frac{1}{2}$ bushels per acre more than the red varieties, but the latter surpassed the former in weight per measured bushel of grain by nearly one pound.

The following table gives the average results of bald and bearded wheats grown side by side for five years in succession :

Years.	Average results of bald wheats.				Average results of bearded wheats.			
	Number of varieties.	Weight per measured bushel.	Straw per acre.	Grain per acre.	Number of varieties.	Weight per measured bushel.	Straw per acre.	Grain per acre.
		lb.	tons.	bush.		lb.	tons.	bush.
1890	11	59.9	2.3	30.6	4	60.1	2.7	31.7
1891	16	62.9	2.0	55.9	7	64.3	1.9	46.1
1892	24	59.6	3.3	40.2	20	61.6	3.2	45.5
1893	30	57.4	2.2	30.0	22	59.8	2.0	29.9
1894	42	60.5	3.9	48.7	38	61.0	4.1	44.4
Average	....	60.1	2.7	41.1	... .	61.4	2.8	39.5

Varieties possessing very short beards are classified as bald wheats. The bearded varieties gave the heaviest weight of grain per measured bushel for each year, and the poorest yield of grain per acre for three out of the five years. The number of the bald and bearded varieties is about equal, while in the case of the white and the red grained wheats, the latter has more than double the number as compared with the former.

Experiments of Wheat Cultivation.

Concise statements regarding the experiments in wheat cultivation:

Different dates of seeding. The average results for two years in sowing winter wheat on September 2nd, September 9th, and September 17th are slightly in favor of the middle date ; but, as the crop from the first-sown grain was the most lodged in 1894, future experiments may give different results.

Methods of seeding. By sowing winter wheat from all the tubes of a grain drill, the average yield per acre was 44.6 bushels ; from every second tube of a grain drill, 42.2 bushels ; and by broadcasting with the hand, 43.6 bushels.

Selection of seed. Several experiments in the selection of seed grain were conducted, but they are too complicated to report in this bulletin. It might be mentioned, however, that in 1894 plump seed produced heavier grain than shrunken seed ; but the difference in the yield per acre was very small.

Different quantities of seed per acre Two varieties of winter wheat were each sown on small plots at the rate 1, $1\frac{1}{2}$ and 2 bushels of seed per acre, and the average results show that the largest yield was obtained from the thickest seeding, but the best quality of grain was from the medium amount of seed. The proper quantity of seed to sow can be best determined by the various wheat-growers themselves, as much depends upon variety of grain, fertility of the soil, etc.

Sowing spring barley in the autumn, to form a mulch for wheat in winter. Two varieties of wheat were sown with and without spring barley of September 5th, 1893, and the results go to show that slightly better yields were obtained when the barley was not used.

Cutting grain at different stages of maturity. Two varieties of winter wheat which were considered about right for cutting by the 19th of July, were cut on July 4th, 11th, 19th, and 25th, and August 2nd. The heaviest grain was from the cutting on July 19th, and the largest yield of grain on August 2nd. The lowest results, in both these particulars, were from the first cutting.

Conclusions.

1. The average results of winter wheat grown on the experimental plots for five years in succession are as follows: Weight of grain per measured bushel, 60.6 lb.; yield of straw per acre, 2.74 tons; and yield of grain per acre, 40.6 bushels.

2. Among eighty varieties of winter wheat tested, the following have made high records: (1) Dawson's Golden Chaff; (2) American Bronze; (3) Early Genesee Giant; (4) Surprise; (5) Early Red Clawson; (6) Golden Drop; (7) Jones' Winter Fyfe; (8) Bulgarian; (9) Early Ripe; and (10) Pride of Genesee.

3. The Dawson's Golden Chaff has made the best record of all the varieties of winter wheat tested in the experimental department.

4. Within certain limits, the amount of straw produced by a winter wheat is a poor indication of the yield of grain.

5. For five years in succession the bearded wheats gave a larger average weight per measured bushel than the bald varieties.

6. The white wheats have given the best results in favorable years, and the red wheats in unfavorable years.

Distribution of Seed for Testing Purposes.

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 next year. The seed will be sent out in the order of the applications received, as long as the supply lasts.

Two Sets of Winter Wheat for Co-Operative Tests.

I.	II.
Dawson's Golden Chaff.	Dawson's Golden Chaff.
Early Red Clawson.	Early White Leader.
Jones' Winter Fyfe.	Early Genesee Giant.
Surprise.	Early Ripe.
American Bronze.	Pride of Genesee.

Each person wishing one of these sets should write to the Experimentalist, Agricultural College, Guelph, *mentioning which set he desires*, and 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.

Seed Wheat.

The Dawson's Golden Chaff and American Bronze varieties of winter wheat were grown in the farm department in 1894. A limited quantity of these two varieties has been offered for sale this season at $1.00 per bushel, including bags.

The supply is now completely exhausted, owing to the large demand.

Winter Wheat, Comparative Test of 10 Foreign Varieties.

Ten foreign varieties of winter wheat were grown on the trial grounds in 1894 for the fifth time. The conditions regarding the quality of land. previous cropping, amount of seed per acre, size of plot, etc., used for the foreign varieties were the same as those given for the Canadian and American kinds. The seeding also took place at the same time. These varieties were not included in those which were mentioned in the bulletin issued early in August, as many of them are late in reaching maturity and none take the lead of some of the best Canadian and American varieties.

Varieties.	Country obtained from.	Results for 1894. Weight per measured bushel.	Results for 1894. Straw per acre.	Results for 1894. Grain per acre.	Average results for number of years grown on plots. Weight per measured bushel.	Average results. Straw per acre.	Average results. Grain per acre.
Grown for five years:		lb.	tons.	bush.	lb.	tons.	bush.
1 Spalding Red	England.	59.13	4.62	44.27	58.31	2.28	28.85
2 Dividend	Germany.	54.50	4.00	34.90	52.34	2.74	27.38
3 Square Head Red	England.	58.50	5.10	48 33	....	....	27.11
4 White Patanelle	France.	53.88	4.05	38.23	54.14	2.32	26.21
5 Regent	Germany.	53.13	4.51	27.92	54.55	....	25.10
6 Red Inversible	France.	58.50	3.88	50.63	56.90	2.10	25.09
7 Saumur	France.	55.88	3.56	49.58	54.86	2.01	25.04
8 Browick Red	England.	57.50	3.72	42.82	55.18	2.09	24.08
9 Galizien Summer	Germany.	55.63	3.80	46.67	57.21	1.77	23.01
10 Kessingland Red	England.	53.50	2.73	32.18	51.74	....	20.84

The foreign varieties of winter wheat did much better during 1894 than they did in previous years. As some of them are comparatively free from rust and have fairly stiff straw and several other desirable qualities, it has been thought advisable to continue growing the best of them in the hope that in time they will become sufficiently hardy to withstand the severe weather of the winter, and thus becoming valuable varieties to be grown over Ontario.

As the yield of these varieties during the past season has been better than during the previous years it is not improbable that these may soon become acclimatized.

Varieties discarded. After growing 17 of the foreign varieties side by side for four years, seven of the poorer ones were discarded and the ten best varieties were again sown in the spring of 1894. The following were those which were discarded. Square Head, Lamed Hybrid, Russian Odessa, Golden Drop Red, Imperial Velvet Chaff, Herfordshire White and Lammas Red.

Oats, Comparative Test of 83 Varieties.

The oat crop is one of the most important for the Ontario farmer of the present day. There is more land devoted to the cultivation of oats than of any other variety of grain grown in Ontario. The demand for new and promising varieties is greater than that for any other class of spring grain. The experimental department has been more successful in procuring varieties of oats from foreign lands, which surpass, to a considerable extent, the varieties which are known over Ontario, than in any other class of grain. The number of varieties of oats, which have been tested on the trial grounds in the experimental department, is greater than that of barley, peas, spring wheat or winter wheat.

There were in all 83 varieties of oats tested in 1894; of this number 17 have been grown for six years, 26 for four years, 8 for three years, 18 for two years, and 14 were grown this season for the first time. The plots used for the oats were all exactly the same size, each plot being 10 links wide by one hundred links long, thus making $\frac{1}{100}$ of an acre. The grains were sown broadcast at the rate of 75 lb. per acre, equal quantities of the different varieties being used. Seeding took place on the 20th and 21st of April. The land had received farmyard manure in the spring of 1890, at the rate of 15 tons per acre; and a crop of roots was grown on the land in the same year. The range of plots for the oats was situated between that used for the spring wheat on the one side and those used for the barley and peas on the other. The yields per acre are estimated from the actual yields produced on the plots.

Oats, Comparative Test of 83 Varieties.

Varieties.	Seed obtained from—	Color of grain.	Character of head.	Results for 1894.				Average results for number of years grown on plots.		
				Date of maturity.	Weight per measured bushel.	Straw per acre.	Grain per acre.	Weight per measured bushel.	Straw per acre.	Grain per acre.
Grown for six years:					lb.	tons.	bush.	lb.	tons.	bush.
1 Joanette Black	France	B	S	Aug. 4	35.12	2.59	76.85	35.85	2.68	82.81
2 Siberian (Russia)	Russia	W	S	" 8	36.24	2.71	84.94	35.71	2.62	78.07
3 Oderbrucker	Germany	W	S	" 6	32.08	2.45	70.59	31.68	2.49	74.00
4 Improved Besthorn	"	Y	S	" 6	32.24	2.20	67.82	32.71	2.12	73.89
5 Probsteier	"	W	S	" 6	31.76	2.08	68.76	32.38	2.43	73.46
6 Danebrog	"	W	S	" 8	32.64	2.39	62.50	32.69	2.40	72.92
7 Poland White	France	W	S	" 1	37.64	2.48	74.44	37.52	2.41	72.91
8 Waterloo	Germany	W	S	" 7	31.32	2.15	70.77	30.89	2.53	72.13
9 Bavarian	Ontario	W	S	" 8	30.80	2.61	63.97	30.80	2.69	69.83
10 Egyptian	"	W	M	" 7	34.20	2.45	70.59	34.62	2.74	68.43
11 Georgian	Germany	W	S	" 7	31.80	2.63	69.12	32.47	2.69	68.19
12 Yellow Gigantic	France	Y	M	" 16	31.52	2.37	48.71	29.25	2.65	65.37
13 Black Poland	Scotland	B	M	" 8	29.32	2.62	60.85	29.39	2.85	64.48
14 Rosedale	Ontario	W	M	" 7	34.76	2.29	65.44	33.54	2.88	63.99
15 Black Champion	"	B	M	" 8	30.12	2.31	55.15	29.10	2.47	63.36
16 Victoria White	Scotland	W	S	" 1	38.36	2.10	61.94	38.98	2.60	63.24
17 Black Tartarian	"	B	M	" 8	28.92	2.26	40.62	31.49	2.71	60.35
Grown for four years:										
18 White Schonen	Ontario	W	S	Aug. 7	30.36	2.19	62.50	31.59	2.20	77.28
19 Vick's American Banner	United States	W	S	" 7	30.92	2.12	63.62	30.98	2.18	75.98
20 Wide Awake	Ontario	W	S	" 6	32.76	2.18	62.88	33.01	2.20	74.75
21 Magnet	"	W	S	" 7	30.68	2.45	56.06	30.77	2.41	74.39
22 White Mane	"	W	S	" 7	32.80	1.99	56.62	31.83	2.37	72.66
23 Danish	New Zealand	W	S	" 6	32.24	1.54	62.32	25.54	2.11	71.76
24 Holstein Prolific	Ontario	W	S	" 6	31.80	1.78	59.94	31.65	2.02	71.54
25 Golden Giant	"	Y	M	" 14	30.00	2.15	44.12	28.27	2.26	71.18
26 Early Calder	"	W	S	" 4	33.56	1.88	60.29	32.39	2.27	70.05
27 Giant Yellow	United States	Y	S	July 29	36.12	2.04	65.44	33.71	2.09	67.14
28 Giant Swedish	Ontario	Y	M	Aug. 2	30.92	2.16	43.38	28.73	2.34	66.65
29 Early Gothland	"	W	M	" 6	37.36	2.02	57.74	35.14	2.31	64.69
30 White Belgian	"	W	S	July 30	40.08	1.75	55.88	36.50	2.31	62.72
31 Clydesdale	"	W	S	" 30	42.20	1.78	57.35	37.03	2.62	62.04
32 White Swiss	United States	W	M	Aug. 4	38.20	1.72	52.03	34.75	2.23	61.53
33 Japan	"	W	S	July 30	42.64	1.59	50.74	38.11	2.42	58.74
34 Black Mane	Ontario	B	M	Aug. 7	33.44	1.66	43.56	29.14	2.37	58.67
35 Early Archangel	"	W	S	July 30	41.24	1.56	49.26	31.31	2.19	58.07
36 Dakota	United States	W	S	" 30	42.44	1.57	51.85	38.74	2.49	56.69
37 New Rosedale White	Ontario	W	M	Aug. 6	38.92	1.64	47.44	35.38	2.06	56.56
38 Canadian Triumph	"	W	S	July 30	42.56	1.57	51.85	39.29	2.04	56.31
39 Carter's Royal Cluster	England	W	S	" 30	42.56	1.48	50.91	38.09	2.17	54.95
40 Carter's Early Black	"	B	M	Aug. 7	33.12	1.51	40.44	29.06	....	54.81
41 Victoria Prize White	"	W	S	July 30	42.76	1.47	48.71	39.57	1.94	52.75
42 Rennie's Prize White	Ontario	W	S	" 30	43.00	1.51	49.44	39.03	1.88	51.81
43 Black Glen Rothern	"	B	S	Aug. 16	34.20	1.83	36.59	31.28	2.63	49.65

OATS, COMPARATIVE TEST OF 83 VARIETIES.—*Continued.*

Varieties.	Seed obtained from—	Color of grain.	Character of head.	Results for 1894. Date of maturity.	Results for 1894. Weight per measured bushel.	Results for 1894. Straw per acre.	Results for 1894. Grain per acre.	Average results for number of years grown on plots. Weight per measured bushel.	Average results. Straw per acre.	Average results. Grain per acre.
Grown for three years:					lb.	tons.	bush.	lb.	tons.	bush.
44 Joanette (new French seed)	Ontario	B	S	Aug. 3	34.00	1.80	58.82	34.13	2.40	67.94
45 Baltic White	United States	W	S	" 5	30.92	2.13	51.47	31.37	2.38	62.62
46 Abyssinian	Ontario	W	M	" 6	37.80	1.83	51.47	35.47	2.61	62.09
47 American Beauty	"	W	M	" 6	37.68	1.76	49.44	35.09	2.45	59.35
48 Wilson's White Prolific	United States	W	M	" 5	36.44	1.85	50.00	30.75	2.08	55.80
49 Thousand Fold	"	W	M	" 4	38.08	2.21	52.38	34.16	2.40	54.99
50 Badger Queen	"	W	S	July 28	44.12	1.74	56.62	38.04	2.58	54.21
51 New Wonderful	Ontario	W	S	" 28	43.92	1.80	56.06	37.51	2.27	51.82
Grown for two years:										
52 Black Beauty	United States	B	S	July 30	34.32	2.14	62.50	32.81	2.32	65.10
53 Lincoln	"	W	S	Aug. 6	34.80	1.88	57.35	33.35	2.19	63.18
54 High Bred	"	W	S	July 30	40.64	....	61.76	37.22	...	63.13
55 Green Mountain	"	W	S	Aug. 6	32.08	1.95	58.82	30.54	1.93	61.61
56 New Zealand	"	W	S	" 6	32.76	1.88	57.35	29.63	2.09	60.63
57 Improved American	"	W	S	" 6	32.36	2.00	55.88	31.13	2.05	58.39
58 New American	"	W	S	" 7	32.44	2.06	58.47	30.42	2.08	57.39
59 Challenge	Ontario	W	S	July 31	42.00	2.11	58.26	38.40	2.41	56.08
60 South Carolina Black	United States	B	S	" 31	33.76	1.67	54.79	32.88	2.44	53.60
61 Royal Prize Cluster	England	W	S	" 30	41.68	2.26	63.97	37.59	2.18	52.99
62 Rust Proof	United States	W	S	Aug. 5	34.20	2.17	51.85	31.90	2.24	52.18
63 Excelsior	"	W	S	" 5	31.76	2.10	52.94	30.53	2.05	50.32
64 Jarman's White Monarch	England	W	S	" 3	39.92	2.34	59.38	36.16	2.12	48.69
65 White Dutch	United States	W	S	July 30	42.08	1.67	51.65	38.19	1.99	48.38
66 Jarman's Black Defiance	England	B	M	Aug. 10	31.12	1.88	42.65	29.51	1.84	48.18
67 Pringle's No. 6	United States	W	M	" 12	32.38	2.23	30.88	31.94	2.17	46.54
68 North Star	"	W	S	" 3	39.92	2.16	61.03	36.61	2.08	44.77
69 Texas Rustproof	"	D	S	" 8	29.13	1.98	30.53	29.87	2.14	35.17
Grown for one year:										
70 Surprise	United States	W	S	Aug. 6	32.24	3.26	73.18	32.24	3.26	73.18
71 Negro Wonder	"	B	S	July 30	33.76	2.55	70.59	33.76	2.55	70.59
72 Peerless	Ontario	W	S	Aug. 9	30.56	2.90	64.53	30.56	2.90	64.53
73 Pride of America	United States	W	M	" 6	36.44	2.74	59.56	36.44	2.74	59.56
74 Bolton	"	W	S	" 6	31.88	2.05	59.00	31.88	2.05	59.00
75 Lousinee	Ontario	W	S	" 5	33.92	1.60	58.65	33.92	1.60	58.65
76 Salzer's Great Northern	United States	W	S	" 6	32.52	1.96	58.09	32.52	1.96	58.09
77 Bonanza King	"	W	S	" 6	33.20	1.93	57.35	33.20	1.93	57.35
78 Improved White Russian	"	W	M	" 10	32.36	3.08	47.97	32.36	3.08	47.97
79 Hull	Ontario	W	M	" 10	32.00	2.46	46.71	32.00	2.46	46.71
80 Australian Square Head	United States	Y	M	" 11	30.56	2.47	42.82	30.56	2.47	42.82
81 White Swede	"	W	M	" 10	33.80	2.74	38.79	33.80	2.74	38.79
82 Red Tamworth	Ontario	D	S	" 8	31.00	1.79	35.68	31.00	1.79	35.68
83 Mammoth Cluster	United States	B	M	" 11	27.50	2.03	33.82	27.50	2.03	33.82

The average yield per acre of grain in 1894 was 55.9 bushels per acre, which was 1.6 bushels per acre greater than that for 1893, and 4.6 bushels per acre less than the average of the past six years. The weight per measured bushel during the past season was 34.9 pounds, the average for the past six years being 33.2 pounds. It is interesting to notice that all the leading varieties of oats were obtained by this experiment station from foreign lands. Some of the leading varieties were procured from Russia, France and Germany.

The *Joanette Black*, which stands at the head of the list among seventeen of the leading varieties selected from among 79 kinds grown in the experimental plots since 1889, was imported from France six years ago. It is an oat which is very short in the straw, only averaging about 40 inches in height in the average of six years' trials ; while the Siberian gives an average of about 60 inches in height. In weight per measured bushel it has been quite uniform throughout the different years, the average being 35.9, and the weight in 1894 was 35.1. It is one of the thinnest hulled varieties that has ever been grown on the trial grounds. It has a spreading head of good size. The straw usually stands up well, and is less susceptible to rust than most other varieties. It is medium early in ripening. Upon good strong land this is one of the best yielding oats that we have found in our experience of six years. The *Siberian* variety of oats, which was obtained from Russia, stands next to the Joanette in average yield of grain per acre. It, however, surpassed this variety during the past year by eight bushels per acre. It is a white oat with a spreading head The straw is long and fairly strong. The average weight per measured bushel for six years has been 35.7 pounds, and in 1894 it was 36.2 pounds. Thus it has given a much larger yield of grain per acre than any Ontario variety which has been grown on this farm, both on the small and large plots. Not only has it surpassed all the other varieties of white oats in the co-operative tests on the station plots, but in the average yield of six varieties of oats sent out over Ontario and tested in 125 different localities in 1892, and 105 different localities in 1893. The Siberian took the lead both years. The average yield per acre of this variety in these co-operative tests in 1892 was 58.8 bushels per acre, and in 1893 it was 52.4 bushels per acre. It reaches maturity in about the same length of time as the Joanette. The Siberian might be said to have the best all around record of about 150 varieties which have been tested at the experimental station during the past six years. The *Oderbrucker*, imported from Germany in 1889, stands next to the Siberian in average yield of grain per acre. This variety, however, does not equal the first two mentioned varieties in weight per measured bushel by about four pounds in the average of six years. The *White Schonen* heads the list among twenty-six varieties grown for four years. It also produces a grain which has given an average of only 31.6 pounds per measured bushel in six years' trial. In other respects it is a good oat. The *Black Beauty* heads the list in yield of grain per acre among 18 varieties grown for two years. The seed of this variety was obtained from the United States, and it somewhat resembles the Joanette variety in its habits of growth, although the grain does not weigh so heavy per measured bushel, and the straw grows to a greater length. Among the 14 new varieties grown in 1894 for the first time, the *Surprise* heads the list, and the *Negro Wonder* comes second. The seed of both these varieties was obtained in the United States. The first mentioned is a white oat, and the last a black variety.

Varieties discarded. After growing 79 varieties of oats side by side for five years in succession on our experimental plots, we selected 17 of the leading kinds and continued experimental work with these varieties in the spring of 1894. There were, therefore, 62 varieties discarded from our trial experiments during the past year. Some of these are fairly good varieties, but not the very best for yield of grain, quality of grain, freedom from rust, strength of straw, etc., combined. The varieties which were discarded were as follows : Chenailles Black, Black Etampes, Pringle's Progress, Houdan Black, White Canadian, Siberian (France), Acclimatized Black Tartarian, White Abundance, Improved Waterloo White, Black Hungarian, Nubian Black, California White, Flying Scotchman, American Welcome, Cluster or Triumph, Hopetown (Ontario), August White, Pedigreed Black Tartarian, Early Blossom. Black Tartarian, Flanders White, Prolific Black, Dutch Bren, Yellow August, White (Australia), Podolisher, Victoria Prize White, Carter's Prize White, Carter's Prize Cluster, Black Red Crown, White Tartarian, Thurigen, White Poland, White Hungarian, Welcome, Rennie's Prize White, Racehorse, Yellow Flanders, Colommiers, Potato, Port Adelaide, Early Racehorse, Potato, Round or

Branching Black, Longfellow, Australian White, Brie Black, Angus, Bertram's Prolific, Triumph, Dun, Providence, Hamilton, Hungarian Black, Longfellow, Birlie, Scotch Potato, Dun, Improved Scotch, Hopetown (Germany), Hopetown (Scotland), Selected Winter, and Red Spot.

Comparison between white and black oats. In 1894, there were sixty-two varieties of white and thirteen varieties of black oats grown upon the plots. The white varieties average 57.8 bushels per acre, and 35.9 pounds per measured bushel, and the black varieties gave an average of 52.1 bushels per acre and 32.4 pounds per measured bushel. This shows an average of 5.7 bushels per acre and 3.5 pounds per measured bushel in favor of white oats for the year 1894. The six varieties of yellow oats gave an average of 52.1 bushels per acre, and two varieties of dun oats an average of 33.1 bushels per acre.

Comparison of varieties with mane and spreading heads. Among the eighty-three varieties of oats tested in 1894, fifty-eight possessed heads which were spreading in character, and twenty-five possessed heads with the oats growing along one side, usually termed mane or side oats. The varieties with the spreading head gave an average of 59 bushels per acre, while those with the side head gave an average of only 48.7 bushels per acre. The weight per measured bushel of the former was also two pounds greater than that of the latter. The straw of the mane oats, however, was about one-tenth of a ton per acre greater than in the case of the varieties possessing a spreading head.

Prominent varieties of 1894. The five varieties which gave the largest average yield of grain per acre were as follows: Siberian (Russia), 84.9 bushels; Joanette (France), 76.9; Poland White (France), 74.4: Surprise (United States) 73.2, and Waterloo (Germany), 70.8.

The five varieties of oats which gave the heaviest weight per measured bushel were: Badger Queen (United States), 44.1 pounds; New Wonderful (Ontario), 43.9; Rennie's Prize White (Ontario), 43.0; Victoria Prize White (Scotland), 42.8, and Japan (United States), 42.6.

The five varieties which gave the largest yield of straw per acre were: Surprise, 3.3 tons; Improved White Russian (United States), 3.1 tons; Peerless (Ontario), 2.9 tons; Pride of America (United States), 2.7 tons, and White Swede 2.7 tons.

The three varieties which were the earliest to reach maturity were: Badger Queen, New Wonderful and Giant Yellow: and the two varieties which were latest to reach maturity were: Yellow Gigantic (France) and Black Glen Rothern.

The two varieties which grew the greatest length of straw were the Victoria White and the Siberian.

Beans, Comparative Tests of 13 Varieties.

Thirty-seven plots were devoted to the growing of beans in the summer of 1894. The experiment was principally with different varieties; but in the case of the horse beans, samples were received from five different sources. The land on which the beans were planted did not receive manure for seven years and grew a crop of spring wheat in 1893. Each plot was $\frac{3}{200}$ of an acre in size. The beans were planted on the 30th and 31st of May in rows $2\frac{1}{2}$ links ($19\frac{4}{5}$ inches) apart, there being six rows four rods long of each variety. After reaching maturity they were harvested in the ordinary way and threshed when dry.

The five plots of horse beans all germinated well, and for a time gave promise of a good crop; but when the drouth and hot weather came the vines turned black as in 1893, and the green beans first withered and then dried up. After the fall rains came, however, there was a second growth from the roots, and at the time of the harvesting early in November, the second growth of horse beans was in blossom. The New Bush Lima grew mostly to vines, producing but a very small amount of threshed beans. The Medium or Navy produced the largest amount of threshed beans per acre in 1894, and the Royal Dwarf Kidney came second, followed closely by the California Pea Bean. The latter variety headed the list among those tested in 1893.

Varieties.	Weight per measured bushel.	Yield of straw per acre.	Yield of beans per acre. 1893.	1894.	Average two years, 1893-1894.
	lb.	tons.	bushels.	bushels.	bushels.
1 California Pea	62.38	.70	28.8	16.60	22.70
2 Prolific Dwarf Tree	64.81	.97	27.3	12.64	19.97
3 Small White Field	65.06	.94	24.6	14.17	19.39
4 Medium or Navy	60.38	.64	17.7	19.87	18.79
5 Boston Pea	64.50	.71	22.3	15.21	18.76
6 Yellow Soy	59 13	1.82	20.4	15.56	17.98
7 Giant Dwarf Wax	52.44	.39	15.8	9.10	12.45
8 Yellow Eyed or Boston Favorite	59.50	.28	17.3	4.48	10.89
9 Edamaine	59.00	1.19	7.6	6.94	7.27
10 Marrowfat	62.88	.53	5.9	7.78	6.84
11 Yosemite Mammoth Dwarf Wax	58.19	.88	7.2	6.26	6.73
12 Royal Dwarf Kidney	60.06	.97	....	17.71	
13 New Bush Lima	....	.41	....	.64	

Winter Rye, Comparative Test of 2 Varieties.

In the autumn of 1893 two varieties of winter rye were sown on plots $\frac{1}{100}$ of an acre in size. The seeding took place on September 9th. The seed was sown broadcast at the rate of two bushels per acre. The soil was the same as that used for the varieties of winter wheat previously described.

Varieties.	Weight per measured bushel.	Straw per acre.	Grain per acre.
	lb.	tons.	bushels.
Pennsylvania rye	55.00	5.11	62.9
Common rye	54.88	5.12	56.0

The crop of rye on each of the plots was very large. The straw was long and the heads well filled. The Pennsylvania rye gave an average of nearly seven bushels per acre more than the common rye.

Winter Barley.

A variety of winter barley was received from Kansas Experiment Station under the name of Winter Six-Rowed Nevada. It was sown on the plots $\frac{1}{100}$ of an acre in size, and at the rate of 100 lb. of seed per acre. The soil was similar in every way to that described in the winter wheat experiments. The seeding took place on September 2nd. The following gives the yield of this variety:

Average height, $41\frac{1}{2}$ inches.
Weight of grain per measured bushel, 39 lb.
Yield of grain per acre, 38.2 bushels.
Yield of straw per acre, 1.3 tons.

The winter six-rowed Nevada barley was badly winter-killed, and looked to be nearly a failure in the early spring. That part which did not winter-kill, however, came on very rapidly, and at the time of harvest the ground was nearly covered with a fairly even crop. This variety does not seem to withstand our severe winters any better than the winter barley which we received from Germany a few years ago and tested on our trial plots for three or four years in succession.

Winter Oats, Comparative Test of 2 Varieties.

Two kinds of oats were received from the United States, which were claimed to be winter varieties. They were sown on plots $\frac{1}{100}$ part of an acre in size on September 9th, at the rate of 75 lb. per acre. The remarks regarding the soil are the same as those given for the winter wheats. The oats germinated well and gave a good growth in the autumn, but were so completely killed out during the winter season that not one plant was alive in the spring. We therefore had the same experience with the two varieties of so-called winter oats tested during the last year that we had with the winter variety which was claimed to be a winter oat, and was tested in the year 1892-3.

Grains Sown in Mixture.

In the spring of 1894, oats, spring wheat, peas and barley were sown separately, and also in various combinations. The combinations consisted of six mixtures, with two kinds of grain used in each case. Four mixtures with three kinds of grain used, and one mixture with all four kinds of grain used together. There were, therefore, eleven mixtures in all, and four varieties of grain grown separately. These were all sown from duplicate plots, thus making thirty plots in all. A similar experiment was conducted in 1893. Each plot was exactly $\frac{7}{1000}$ of an acre in size. The grain was sown broadcast on May 11th. Fodder crops were grown on the land in 1893, and farmyard manure at the rate of 20 tons per acre was applied in the spring of 1894.

The following table shows results from sowing grains separately and in mixtures :

Mixtures.	Yield of straw per acre.				Yield of grain per acre.			
	Sown separately.		Sown in mixture.		Sown separately.		Sown in mixture.	
	1894.	Average 1893-4.	1894.	Average 1893-4.	1894.	Average 1893-4.	1894.	Average 1893-4.
	tons.	tons.	tons.	tons.	lb.	lb.	lb.	lb.
Barley and peas	1.18	1.18	1.24	1.43	1,623	1,341	1.594	1,324
Peas and wheat	1.25	1.25	1.36	1.41	1,467	1,216	1,366	1,055
Wheat and oats	1.63	1.70	1.78	1.80	1,531	1,480	1,724	1,735
Barley and oats	1.56	1.63	1.80	1.93	1,688	1,604	2.121	2,168
Wheat and barley	1.29	1.23	1.46	1.36	1,514	1,138	1,719	1,178
Peas and oats	1 52	1.58	1.70	1.93	1,641	1,670	1,683	1,804
Barley, peas and wheat	1.24	1.24	1.47	1.62	1,535	1,235	1,786	1,428
Peas, wheat and oats	1.47	1.51	1.68	1.94	1,546	1,455	1,724	1,689
Barley, wheat and oats	1.49	1.61	1.59	1.89	1,578	1,444	1,902	2,012
Barley, peas and oats	1.42	1.46	1.58	1.83	1,651	1,538	1,920	1,982
Barley, peas, wheat and oats	1.40	1.44	1.60	1.86	1,577	1,410	1,804	1,844

The average results for 1894 show that there was 1,577.4 pounds of grain per acre from the grain sown separately, 1,758.5 pounds per acre from the same kinds of grain grown in combination. This is 181.1 pounds of grain per acre in favor of the grains being sown in mixtures. By examining the results of 1893, along with those of 1894, we find that there is a yield of 244.5 pounds per acre more from the mixture than from the grain when sown separately. In the experiment of 1894 the results show that in nine 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 in 1894 as well as in 1893. The largest yield of grain during the past season was obtained from the mixture of barley and oats, which also gave the largest yield of grain per acre in 1893.

Spring Grains, Different Dates of Seeding.

Barley, peas, spring wheat and oats were sown on different dates in the spring of 1894. The experiments were conducted in duplicate in every case. By referring to the College report of the experimental department for 1891 and also for 1892, the results of similar experiments may be found, in which barley, peas, spring wheat and oats were sown at six different dates. It was the intention to continue this experiment for several years in succession, but owing to the exceedingly wet and cold weather in the early spring of 1893, it was found impossible to get the grains in on their proper dates, and in fact it was not until after the time of the second seeding of 1891 and 1892 that the first seeding could be accomplished in 1893. Therefore, the experiment was not continued during that year. In 1894, however, it was again started, but owing to the exceedingly wet weather during the month of May no seeding took place from the 9th until the end of the month, and the seeding of June 6th was a failure in every instance. We, however, have results of seeding on April 21st, May 1st and May 9th for the present year. The land on which this experiment was conducted in 1894 was a medium clay loam, which had been summer fallowed the previous year.

The following tables give the results of the crop for 1894 and also the average results of the experiment conducted in 1891, 1892 and 1894, for the three dates mentioned.

Barley, Dates of Seeding.

Dates of seeding.	Weight per measured bushel.		Straw per acre.		Grain per acre.	
	1894.	Average 3 years, 1891-2-4.	1894.	Average 3 years, 1891-2-4.	1894.	Average 3 years, 1891-2-4.
	lb.	lb.	tons.	tons.	bush.	bush.
April 21-22	49.78	49.06	1.34	1.14	44.27	32.16
May 1	48.57	47.52	1.28	1.23	41.67	32.49
May 9	44.85	45.62	.83	1.06	12.10	22.17

Barley, which was seeded on April 21st, gave an average of 44.27 bushels per acre, while that which was seeded on May 1st produced nearly three bushels less, and that which was seeded on May 9th nearly 32 bushels less. It is rather surprising to notice that barley sown on May 9th, yielded less than one-third as much as the same kind of barley sown on the same land, and under similar conditions, 19 days earlier. The average results for three years show that the seeding of May 1st gave a slight increase in yield of grain per acre over that sown on the 21st and 22nd. In every instance the weight per measured bushel of the barley was best from the earliest seeding and decreased as the dates of seeding became later.

PEAS, DATES OF SEEDING.

Date of seeding.	Weight per measured bushel.		Straw per acre.		Grain per acre.	
	1894.	Average 2 years, 1892-4.	1894.	Average 2 years, 1892-4.	1894.	Average 2 years, 1892-4.
	lb.	lb.	tons.	tons.	bush.	bush.
April 21-22	60.91	59.41	1.33	1.32	45.10	32.30
May 1	62.41	60.81	1.22	1.31	46.00	33.55
May 9	62.75	61.73	1.03	1.12	35.02	28.41
June 6-7	59.35	60.43	....	....	20.83	13.02

The seeding of peas on May 1st gave better results in weight per measured bushel and in yield of grain per acre during 1894, and also for the average of two years, than the sowing of April 21st and 22nd. The seeding on May 9th, however, gave a considerably less yield per acre, but gave a heavier weight per measured bushel than any of the earlier dates of seeding.

SPRING WHEAT, DATES OF SEEDING.

Dates of seeding.	Weight per measured bushel.		Yield of straw per acre.		Yield of grain per acre.	
	1894.	Average, 3 years, 1891-2-4.	1894.	Average, 3 years, 1891-2-4.	1894.	Average, 3 years, 1891-2-4.
	lb.	lb.	tons.	tons.	bush.	bush.
April 21-22	60.29	60.56	1.62	1.33	27.43	18.74
May 1	56.10	57.90	1.12	1.10	17.33	13.91
May 9	54.75	....	.81	.95	11.67	9.62

There is no class of grain which shows greater advantage from very early seeding than spring wheat. We notice from this experiment that the spring wheat which was sown on April 21st in 1894 gave 10 bushels per acre more than that which was sown only eleven days later, and the average of three years shows an advantage of about 5 bushels per acre in favor of the early seeding. The weight per measured bushel of the spring wheat is very much heavier from the early seeding than from those sown later in the season.

OATS, DATES OF SEEDING.

Dates of seeding.	Weight per measured bushel.		Yield of straw per acre.		Yield of grain per acre.	
	1894.	Average, 3 years, 1891-2-4.	1894.	Average, 3 years, 1891-2-4.	1894.	Average, 3 years, 1891-2-4.
	lb.	lb.	tons.	tons.	bush.	bush.
April 21-22	34.51	33.50	1.64	1.56	56.78	54.05
May 1	33.50	32.43	1.27	1.45	47.06	53.62
May 9	31.35	29.92	1.20	1.29	35.32	47.57

There is an advantage in favor of early sowing of oats in the production of both straw and grain and in the quality of the grain as indicated by the weight per measured bushel. The results are worthy of our very careful study and point to the great advantage in getting oats sown as early in the spring as the soil is in proper condition for cultivation.

Spring Grains, Selection of Seed.

A considerable amount of work was carried on during the past year in the selection of seed of barley, peas, spring wheat and oats. We think this one of the most important branches of work which can be taken up at an experiment station. We have had sufficient experience to show that the quality of seed sown has a marked influence on the ultimate yield of the crops. The work of selection of seeds in connection with the grain experiments was commenced to a limited extent in 1892; in 1893 it was extended, and in 1894 the experiments were again increased. To carry on this work to give the best satisfaction requires a great deal of time and labor, but as each season passes by we become in a much better position to carry on careful and systematic work along this line. It is our rule invariably to handpick the 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 been first well cleaned. About 6,000 packages of seed grain were very carefully cleaned and handpicked in the winter of 1893-4. By this careful work in the selection of grain according to a fixed type great improvement has been made in the varieties which are now being tested in the experimental department. For instance when the Herison Bearded spring wheat was first imported from France the straw and the heads were both irregular. Some of the heads were long and some were short. By selecting the best seed for the past five years we have made the Herison Bearded produce a very nice even crop. The same treatment which has been given to the seed of the Herison Bearded has also been given to all other varieties under experiment. For the experiments which were conducted in 1894 for the express purpose of observing the influence of different qualities of seed on the crop produced, 26 plots were used. These were situated on the higher part of our experimental field in one single range, which was about 32 rods long. The land was plowed the autumn previous and was thoroughly cultivated in the spring before the seeding took place. The grain was sown broadcast on plots $\frac{1}{100}$ of an acre in size. The barley, spring wheat and peas were sown on May 4th and the oats on May 8th. The yields per acre are estimated from the actual yields from the plot.

Barley, Selection of Seed.

No. of plot.	Selection.	Amount of seed used per acre.	Weight per measured bushel.	Yield of straw per acre.	Yield of grain per acre.
			lb.	tons.	bush.
1	Large plump	80 lb	50.56	1.36	46.87
2	Small "	Same weight of seed as for No. 1 plot	49.75	1.38	45.73
3	Shrunken	" " "	50.56	1.22	35.83
4	Small plump	Same number of seeds as for No. 1 plot	48.81	1.58	37.50
5	Shrunken	" " "	49.00	1.37	36.27
6	Cracked..........	Same weight as for No. 1 plot	50.31	1.56	35.00

It will be observed that the same weight of seed was sown on plots numbers 2 and 3 as that sown on number 1. In the case of 4 and 5, however, the weight was much less as the grains were all carefully counted and the same number of grains in each case was sown as on plot number 1. This point will need to be kept in view when considering the results. Large plump seed gave the largest yield per acre which was closely followed by the small plump seed, of which there was an equal weight sown. When the same number of small plump seeds was sown as those in number 1 plot, the yield was about nine bushels per acre less. It will be seen that the large plump grain gave the best results in yield per acre throughout.

PEAS, SELECTION OF SEED.

No. of plot.	Selection.	Amount of seed used per acre.	Weight per measured bushel.	Yield of straw per acre.	Yield of grain per acre. 1894.	Yield of grain per acre. Average 2 years 1893-4.
			lb.	tons.	bush.	bush.
1	Large	280 lb	58.31	.64	18.83	19.32
2	Small	The same weight as for No. 1 plot	58.94	.70	20.83	19.32
3	"	The same number of grains as for No. 1 plot.	58.94	·60	17.17	....
4	Cracked	The same weight as for No. 1 plot	....	....	.83	2.62

From the above table it will be seen that, in the average of two years' experiments, small peas which were sound and perfect in every respect gave exactly the same yield of crop per acre as the large peas, when sown in equal weights per acre. It will be understood, however, that there were about twice as many plants in number two plot as in number one. When there was the same number of small peas as there was of large peas sown, the results of 1894 show an advantage of 1.66 bushels per acre in favor of the large peas. There is but a very small percentage of the cracked peas which grew, the germs evidently having been destroyed.

PEAS, SOUND *vs.* BUGGY.

Method of seeding.	Amount of seed used per acre.	Yield of grain per acre.
	lb.	bush.
Sound	130	6.16
Buggy	107	1.17

A little experiment was conducted in 1894 in which two plots of equal size were sown with peas. One plot was sown with sound peas and the other with peas which had been eaten by the pea weevil (Bruchus Risi). An equal number of peas was sown upon the plots in both cases. 130 pounds of the sound peas were sown and 107 pounds per acre of the buggy peas. This goes to show that the pea bug had consumed 18 per cent. of the peas. As a garden variety of peas was used for this experiment, and as the seeding was very light owing to the limited number of buggy peas which could be secured, the yield per acre in 1894 is low, as indicated by the table above. However, as the same number of peas was sown on each plot, it answers for the sake of comparison. It will be seen that the sound peas gave over five times as large a yield per acre as the buggy peas.

SPRING WHEAT, SELECTION OF SEED.

No. of plot.	Selection.	Amount of seed used per acre.	Weight per measured bushel.	Straw per acre.	Yield of grain per acre.
			lb.	tons.	bush.
1	Large plump	80 lb	62.13	1.54	26.16
2	Small "	Same weight of seed as for No. 1 plot....	62 50	1.54	28 51
3	Shrunken	" " "	62.94	1.40	27.84
4	Small plump	Same number of seeds as for No. 1 plot....	61.94	1.26	24.67
5	Shrunken	" " "	61.81	1.24	22.67

The results of 1894 from sowing different qualities of spring wheat seed seem to point out that a larger yield per acre may be obtained from sowing small or shrunken seed, providing as large a quantity of seed is used as when large, plump grain is sown. There would be about double the number of plants on the land which received the inferior seed, and, as the seeding was light in every instance, there being only $1\frac{1}{3}$ bushels per acre of the large plump seed sown, we might expect different results were there a larger number of plants on the land which received the good grain. This is made manifest by plots four and five as, in this instance, exactly the same number of seeds was sown on each plot as was sown on plot number one; and we find that the yield was somewhat less when the small plump seed was sown, and considerably less in the case of the shrunken seed being used. This experiment goes to show that a plant from a large plump grain of spring wheat will produce a greater weight of grain than one from a small plump seed or shrunken seed of the same variety.

SELECTION OF SEED, POLAND WHITE OATS.

—	Selections.	Weight per measured bushel.	Straw per acre.	Grain per acre.
		lb.	tons.	bush.
1	Large plump	37.12	1.30	50.59
2	Medium	37.25	1.46	41.46
3	Small	37.93	1.44	32.38
4	Double (whole)	37.62	1.42	39.11
5	Double (outer grain)	37.87	1.18	34.40
6	Double (inner grain)	35 93	.86	20.00

In the above experiment the same number of seeds was sown on every plot, the number required for each plot of $\frac{1}{100}$ of an acre was 8,160 grains. The seed for plots number 1, 2 and 3 were selected by first sifting and then hand-picking the grain. The seed for number 4 plot was all carefully hand-picked from a quantity of oats. They are what we call double grains. It is often observed, especially in a poor season, that a small oat will be enclosed inside the hull of a larger grain. It would be found upon examination that there were twice as many grains sown on number 4 plot as on any one of the other four plots, although there would appear to be the same number.

For numbers 5 and 6 plots an equal number of double grains, as was used for number 4 plot, was selected and then these were carefully separated, the outer grains being put in one pile and the inner grains in another. These were sown separately. It will be observed from the above table that the large plump grain gave the largest yield per acre. This was followed by the medium sized grain and then by the double grains. The results are certainly very interesting and should be of value, as there is a difference of over nine bushels per acre between the plot which gave the best results and the plot which gave the second best, and there were $2\frac{1}{2}$ times as much grain produced by number one plot as by number six plot.

SELECTION OF SEED, JOANETTE OATS.

Selections.	Weight per measured bushel.		Straw per acre.		Grain per acre.		
	1893.	1894.	1893.	1894.	1893.	1894.	Average, 2 years, 1893-4.
	lb.	lb.	tons.	tons.	bush.	bush.	bush.
Dark plump	32.3	34.52	1.96	1.82	45.7	67.34	56.52
Light "	30.3	32.81	1.82	1.64	38.0	50.87	44.44
Hulled	33.8	34.87	1.44	1.50	34.4	57.36	45.88

An experiment was carried on in 1893, and again in 1894, by sowing different qualities of seed of the Joanette oats. This is a black variety, and for one plot large, plump, black grains were selected; for another plot, grains which had become considerably faded in color were selected; and for the third plot, grains from which the hull was completely removed were chosen. It appears to be the natural tendency of black oats to become pale in color if grown for several years in succession in this country; hence the reason for selecting the light oats. The Joanette oat is one of the thinnest hulled varieties among 150 kinds which have been tested here during the six past years. It is so thin in the hull that usually in threshing a small percentage have their hulls removed. We were desirous of knowing what influence this would have upon the germination and after-growth of the kernels. In the experiment of 1894, the same number of grains was used on each plot; there being 9,157 grains sown on each plot, which was $\frac{1}{100}$ of an acre in size. The results in 1894 show that the largest yields per acre were obtained from the black, large plump oats; and that the smallest yield per acre was produced from the light colored oats. In 1893, the largest yield was obtained from the same selection as in 1894, but the lightest yield was obtained from the hulled samples. From this experiment it will be seen that the majority of the hulled oats will grow; but, all things considered, the best results will be obtained from sowing the large, plump black oats.

SPRING GRAIN, DRILLING *vs.* BROADCASTING.

In the spring of 1894, barley, peas, spring wheat, and oats were sown both with a drill and by hand on plots of the same size. This was carried on in duplicate. The grain drill used contained ten tubes, the tubes being about eight inches apart. The seeding took place on April 25th and 26th. The land on which this experiment was conducted produced a crop of roots in 1893, and had received a dressing of 15 tons of farmyard manure per acre before the roots were sown in that season. The average results of the duplicate experiments of all classes of grain above-mentioned will be seen in the following table :

	Average yield per acre.	
	Straw.	Grain.
Drilled	1.95 tons.	46.3 bushels.
Broadcasted	1.88 "	45.6 "

From these results, it will be seen that there was a slight advantage in favor of drilling the grain, in yield of both straw and grain per acre ; but the difference is not very marked. This experiment will likely be continued.

Potatoes and Roots.

The number of potatoes and roots has been increased during the past year by adding some of the newer varieties, which have become prominent in the United States and Canada. During 1894, 178 varieties of potatoes, and 226 varieties of roots were grown on the experimental plots. The land on which these were grown might be termed an average clay loam, with a very gradual slope towards the southwest. The land for the greater number of these experiments produced a crop of spring grain in 1893, and was manured at the rate of 20 tons per acre in the early spring of 1894. The plots for the variety tests were each exactly $\frac{1}{100}$ of an acre in size, with eight or ten exceptions, in which cases smaller plots were used on account of the limited quantity of seed at our disposal. The soil was fairly uniform throughout. Besides the experiments with varieties a large number of tests was made in methods of cultivation of both potatoes and roots. The plots for these varied in size according to circumstances, as will be noted when speaking of the results of the separate experiments.

Potatoes, Comparative Test of 178 Varieties.

In 1894, 178 varieties of potatoes were grown on the trial plots in the experimental department. In some cases two or three samples of the same variety from different localities were grown, and again in some instances potatoes of the same variety with slightly different names were grown upon the plots, and these are included in the 178 mentioned above. The seed of these varieties was obtained during the past five years from the United States, Prince Edward Island, Nova Scotia and Ontario. Twenty-three of the number have been grown on our plots for five years in succession, 16 for four years, 67 for three years, 49 for two years, and 23 were grown in 1894 for the first time in the experimental department. Planting took place on June 1st to 4th in the case of all varieties, with the exception of Silver Dollar and the Great Divide, which were planted on June 7. The plots were $\frac{1}{100}$ of an acre in size, and 15 pounds of potatoes were planted on each plot. This quantity was divided as evenly as could be done into 198 pieces. 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, and the potatoes were placed four inches below the level of the land. 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 two-horse potato digger The potatoes were weighed about a week after being dug. The following table shows the results :

Potatoes, Different Preparation of Seed Tubers.

Varieties.	Results for 1894. Percentage of crop marketable.	Results for 1894. Weight of 30 best developed potatoes.	Results for 1894. Yield per acre.	Average yield per acre for number of years grown on plots.
Grown for five years:		lb.	bushels.	bushels.
1 Empire State	93.48	10	191.67	**184.81**
2 Thorburn	92.50	11	222.08	**166.74**
3 Summit	87.11	8	158.33	**165.67**
4 Early Mane	82.25	6¾	173.75	**150.19**
5 Early Puritan	88.66	7¾	205.83	**144.37**
6 Sweet St. Vernal	83.57	7¼	172.50	**141.46**
7 Early Sunrise	88.43	7¾	201.67	**141.37**
8 Beauty of Hebron	89 67	8	225.83	**141.09**
9 Pootaluck	84.08	7½	185 83	**140.69**
10 Daisy	87.11	6½	187.50	**140.62**
11 Rural New Yorker No. 2	91.96	10	176.25	**139.65**
12 Late Rose	87.91	7	189.58	**139.60**
13 Minister	94.64	11¼	194.17	**128.27**
14 Rural Blush	91.63	9¾	189.17	**125 59**
15 Rose's New Invincible	91.21	9½	203.75	**123.71**
16 White Elephant	88 61	8¾	197.50	**121.42**
17 Green Mountain	89.67	8½	165.42	**119.96**
18 Halton's Seedling	79.04	6½	172.92	**117.86**
19 Crown Jewel	79.72	6¼	176.67	**115.65**
20 Dakota Red	86.00	6	116.67	**112.45**
21 Early Ohio	80.99	6½	151.25	**110.73**
22 Rosy Morn	74.12	5	154.58	**105.24**
23 Stray Beauty	76 92	5	130.00	**93.28**
Grown for four years:				
24 Tonhocks	76.03	5¾	191.25	**171.79**
25 Convoy	86.80	7½	202 08	**157.32**
26 Woodbury White	86.06	7	209.17	**148.67**
27 Early Oxford	83.63	7	188.33	**148.41**
28 Advance	78.32	5¼	188 33	**144.28**
29 Thunderbolt	84.15	8½	194 58	**144.05**
30 Badger Queen	91.01	9¼	190.00	**141.78**
31 Early Rose	86.48	8½	194.17	**141.24**
32 Hoffman	78.40	7	192 92	**141.08**
33 Early Rochester	87.38	7¾	175 00	**136.60**
34 Kosh Konong	87.30	9¼	183.75	**134.81**
35 Ohio Junior	90.08	10¼	214.17	**131.99**
36 Early Dominion	84.15	8¼	178.75	**131.39**
37 Silver King	83.07	8	182.08	**131.17**
38 Putnam	77.38	7	152.92	**125.53**
39 Queen of the Valley	86.96	9	182.08	**111.60**
Grown for three years:				
40 Burbank's Seedling	87.69	7½	237.08	**180 96**
41 Early Everitt	85.69	9	227.08	**178.76**
42 White Star	94.64	13¾	225.42	**177.34**
43 Early Gem	89.19	9¼	231.25	**177.22**
44 Molly Star	84.02	8	213.75	**174.58**
45 Mammoth Pearl	89.46	9	209 58	**171.26**
46 King of the Roses	79.57	7¼	193 75	**171.12**
47 Thorburn's Extra Early	80 40	7½	206.25	**168.35**
48 New Queen	93.90	11	218.75	**167 65**
49 Polaris	83.47	7	204.17	**167 52**
50 The Dandy	84.15	7	212.92	**165 97**
51 Hotel Favorite	83.06	8	206.67	**165.82**
52 St. Patrick	81.54	8	205.42	**162 47**
53 Paris Rose	76.55	7¼	215.00	**161.40**
54 Burpee's Extra Early	77.20	5¾	199.17	**160 26**
55 May's Imperial	91.23	9½	308.75	**159.72**
56 Ohio Junior	92.72	9¼	217.50	**158.90**

POTATOES, DIFFERENT PREPARATION OF SEED TUBERS.—*Continued.*

Varieties.	Results for 1894. Percentage of crop marketable.	Weight of 30 best developed potatoes.	Yield per acre.	Average yield per acre for number of years grown on plots.
		lb.	bushels.	bushels.
Grown for three years: Continued.				
57 Everitt's Seedling	77.11	6¾	192.92	**158.51**
58 Watson's Seedling	81.82	7¼	192.50	**158.37**
59 Island McDonald	90.68	9½	178.75	**156.78**
60 Vick's Perfection	81.18	6½	212.50	**156.37**
61 The Ideal	81.29	6½	213.75	**156.12**
62 Red Australian	90.20	7¼	187.08	**156.09**
63 Munroe Co. Prize	89.67	9¼	177.50	**153.70**
64 Halo of Dakota	79.09	6¾	183.33	**153.58**
65 Eureka	82.67	8¼	187.50	**152.90**
66 N. B. & G. Co's Grand Mogul	93.03	8	185.42	**151.94**
67 Early Market	92.61	9¼	202.92	**151.37**
68 Negro	65.89	5	160.00	**151.27**
69 Early May Flower	76.46	6	192.92	**150.44**
70 Sunlit Star	82.66	8½	206 67	**149.56**
71 Dempsey's Seedling	78.01	6¼	180.00	**149.20**
72 Woodbury White	89.64	8½	245.42	**148.87**
73 Chicago Market	78.77	7	176 67	**147.82**
74 P. E. I. Early Rose	91 82	8½	203.75	**147.52**
75 Mount Carbon	91.55	9¼	212.08	**147.36**
76 State of Maine	90.95	7¾	184.17	**147.26**
77 Vick's Champion	91.93	10½	201.25	**146.42**
78 Edwards	90.18	9	250.42	**146.01**
79 Landreth's State of Maine	89.79	8½	240.83	**144.61**
80 Early Essex	82.50	6	166.67	**144.29**
81 Chautauqua	88.79	8	185.83	**143.61**
82 Morning Star	88.84	6	186.67	**143.49**
83 The Rosedale	85.59	7½	199 58	**143.46**
84 Prince Albert	85.82	7	170.42	**141.41**
85 Alexander's Prolific	90.16	8½	186.25	**141.22**
86 Delaware	85.64	7	162.50	**141.10**
87 Boley's Northern Spy	89.98	8½	199.58	**137.66**
88 White Lily	87.23	9½	228.33	**137.64**
89 Landreth's Farmer's Alliance	90.85	7½	182.08	**137.23**
90 Mammoth Pearl	93.80	11½	201.67	**137.09**
91 Landreth's Garfield	74.44	6¼	166.25	**136.68**
92 Wilson's First Choice	86.75	7½	201.25	**136.42**
93 Extra Early Vermont	84.63	7¾	176.25	**135.42**
94 Vaughan	90.09	10¾	285.83	**134.61**
95 Harbinger	74.89	6½	189.17	**133.99**
96 Belle, A. C	94.56	8½	183.75	**132.38**
97 Rose Seedling	96.34	11¾	193.75	**131.65**
98 Snowflake	48.97	4	161.67	**130.16**
99 Chas. Downing	54.99	3¾	162.92	**129.84**
100 Snow Queen	77.64	5¾	169.58	**128.06**
101 Hopeful	92.84	9¾	197 92	**126.71**
102 Royal Adelaide	90 91	8¾	169.58	**125.06**
103 Lady Finger	56.24	6½	190.42	**124.47**
104 McIntyre	88.52	9¾	174.17	**121.79**
105 Garnets	92.45	8	137.92	**118.04**
106 Pearce's Prize Winner	92.05	11	152.08	**95.63**
Grown for two years:				
107 Pearl of Savoy	95.78	14¾	276 67	**236 04**
108 American Giant	95.15	14	283.75	**227.68**
109 American Wonder	95.75	13¼	362.92	**225.61**
110 Vick's American Wonder	97.01	16	348.75	**222.73**
111 Columbus	92.21	11½	267.50	**217.10**
112 Burpee's Superior	88.92	9¾	259.58	**209.19**
113 Nebula	84.41	7¾	251.25	**208.33**
114 Early Pontiac	86.80	7¾	246.25	**207.33**
115 Woodbury White	93.38	10	251.67	**207.09**
116 Alexander's Prolific	90.29	11	287.50	**206.90**
117 Bill Nye	85.16	10¾	280.83	**206.02**
118 Keiser	94.41	11½	298.33	**204.97**

POTATOES, DIFFERENT PREPARATION OF SEED TUBERS.—*Continued.*

Varieties.	Results for 1894. 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: Continued.		lb.	bushels.	bushels.
119 Arizona	91.33	11	297.92	204.76
120 North Pole	87 07	8¾	232.08	204.59
121 Early Harvest	91.00	10¼	282.50	203.95
122 Improved Rose	92.81	12	278.33	201.42
123 Early Norther	91.94	12½	279.17	200.84
124 Six Weeks	94.43	12½	276.67	199.99
125 Early June Eating	92 73	14¼	252.08	198.54
126 Rochester Rose	92 98	10½	243.33	193.97
127 Potentate	92.77	11	270.83	192.72
128 Timpe's No. 4	89.84	11	233.75	192.53
129 Early Six Weeks	87.75	10	231 25	192.48
130 Scotch Regent	91.35	9¾	274.58	191.04
131 Steele's Earliest of All	88 27	8¾	245.00	190.65
132 Golden Harvest	91.42	10¾	252 50	188.75
133 Early Yorker	90.48	12	245 00	187.70
134 Bruce's White Beauty	82.92	8¼	234.17	185.84
135 Beauty of Beauties	94 54	13	267.08	185.84
136 World's Fair	89.91	10	268.33	182.52
137 Pride of Ireland	94.06	13½	259 58	181.89
138 Parson's Prolific	94.51	13¼	265.83	181.87
139 Van Orman's Earliest	87.40	8	218.33	180.42
140 Montana Wonder	90.69	9¼	295.42	179.16
141 The Freeman	81.82	8½	224.75	177.93
142 Browell's Seedling	94.03	13½	223.33	175.67
143 Granger	87.73	9½	207.08	173.74
144 Reed's Eighty-Six	89.54	11¼	310 83	172.32
145 General Gordon	95.83	13¾	314.38	171.79
146 The People's	96.14	12¼	269.58	168.09
147 Seneca Beauty	97.96	16	184.17	164.39
148 Ontario	93.93	15	219.58	154.59
149 Howe's Premium	91.43	7	194 58	147.29
150 Manitoba Rose	97.50	14	266.67	145.84
151 Great West	88.46	12¾	195.00	141.05
152 Maggie Murphy	97.48	16	248.13	137.42
153 Columbian Peach Blow	92.21	10¼	240.83	137.32
154 Eyeless	82 58	6¾	184.17	127.09
155 New Satisfaction	90.75	11¼	220.83	126.07
Grown for one year:				
156 Great Divide (Van Orman's Seedling No. 75)	96.40	11	347.50	347.50
157 Vick's American Wonder	98.95	22½	316.67	316 67
158 Troy Seedling	96.18	13¾	316.67	316.67
159 Irish Daisy	94.38	13¾	311.25	311.25
160 Salzer's Prize-taker	91.99	11¼	275.83	275.83
161 Clay Rose	96.85	18½	251.25	251.25
162 Snowdrop	87.01	10¾	243.75	243.75
163 Pride of the Market	96.72	11½	241 67	241.67
164 Adirondack	94.38	8¾	237.08	237.08
165 Hartzel's Seedling	97.88	12	236.25	236.25
166 Vanguard	92.34	11	233.75	233.75
167 Governor Rusk	94.65	11	233.75	233.75
168 Victor Rose	97.10	17¼	230.00	230.00
169 Pride of the Table	96.55	16	229.58	229.58
170 Clark's Nonesuch	98.18	16¾	229.17	229.17
171 Pride of the West	94 48	16	227.92	227.92
172 Russell's Seedling	90.87	9	214 58	214.58
173 Bell's Stray Beauty	93 07	7	192.50	192.50
174 Restaurant	94 77	14¾	191.25	191.25
175 Wilson's Stray Beauty	88.81	8¾	184.38	184.38
176 Silver Dollar	91.74	9¼	181.67	181.67
177 The Hopeful	90.41	9	173.75	173.75
178 Vick's White Gem	88.64	11¾	150.42	150.42

The yield during 1894 was quite large, reaching as high as 362.9 bushels per acre, the lowest yield being 116.7 bushels per acre. There were not more than a dozen rotten potatoes found in nearly four acres of crop grown in the experimental department in 1894. Owing to the dry weather in the middle of the season and the numerous rains later on, the late potatoes gave better results than the early ones.

The largest yield per acre in 1894 was produced by the *American Wonder*, which gave a yield of 362 9 bushels per acre ; of this quantity 95.8 per cent. were marketable. Another sample of this same variety, under the name of Vick's American Wonder, gave a yield of 348.8 bushels per acre, and also another sample received of this same variety, the seed of which was obtained in the spring of 1894, gave a yield of 316.7 bushels per acre.

The *Empire State*, which stands at the head of the list in average yield per acre for five years, did not do quite so well in 1894 as previously in comparison with other varieties. It, however, made a fine record in the co-operative experiments in 1894 over Ontario, giving the highest average yield among six leading varieties tested very carefully in 38 different localities reported upon. It is a potato of good quality, and in 1894 required 122 days from planting time until it was ready to be dug.

The *Thorburn* variety stands second in average yield per acre among 23 varieties grown for five years in succession. This variety gave an average of 222 bushels in 1894, and by so doing has made a sufficient average for five years to place it head of the *Summit*, which variety in 1893 stood second among the varieties grown for four years

The varieties which gave the smallest percentage of small potatoes in 1894 were *Vick's American Wonder*, Clark's Nonesuch, Seneca Beauty, Hartzel's Seedling and Manitoba Rose ; and the varieties which gave the largest percentage of small potatoes were Snowflake, Chas. Downing, Lady Finger and Negro.

The largest individual potatoes were produced by the Vick's American Wonder, Clay Rose and Victor Rose.

The varieties which were the earliest to reach maturity were the Stray Beauty, Negro, Chas. Downing, Snowflake and Howe's Premium, and those latest to reach maturity were Columbian Peach Blow, Troy Seedling, Rose's New Invincible, American Giant and Ontario.

Potatoes, Different Depths of Planting Seed Tubers.

An experiment was conducted in 1894 in which potatoes were planted 1, 3, 5 and 7 inches below the surface. A similar test was carried on in each of the following years 1891, 1892 and 1893. During the past year the tests were made with four different varieties of potatoes, Rural New Yorker No. 2, Tonhocks, N. B. & G. Co.'s Grand Mogul, and American Giant. There were, therefore, 16 plots devoted to this experiment in 1894. Each plot consisted of one row, four rods long. Three and one-third links were allowed between each two rows. The nature of soil and the previous cropping were the same as with the variety tests. Planting took place on June 9th. The seeds were placed one foot apart in the row. The results were as follows :

Depths of planting.	Results for 1894.			Average yield per acre for 1891-2-3-4 (10 separate tests).
	Percentage of crop marketable.	Weight of 30 large potatoes.	Yield of whole crop per acre.	
		lb.	bushels.	bushels.
1 inch	96.42	18.00	433.13	214.48
3 inches	97.87	18.31	424.69	223.25
5 "	98.61	20.56	437.50	234.63
7 "	99.05	21.06	379.69	229.55

It will be observed from the above summary that the largest average yield per acre was produced by planting the seed tubers five inches below the level of the surface, and the second largest yield by planting one inch below the surface. Shallow planting, as compared with deep planting in 1894 gave better comparative results than during the three years previous. The largest yield per acre was obtained from planting seven inches deep in 1891, seven inches deep in 1892, three inches deep in 1893, and five inches deep in 1894. The largest average yield of potatoes per acre for the past four years is from planting *five inches deep.* It must be remembered that these are the results from the soil on this farm, which might be termed an average clay loam, which is well underdrained.

In 1894 the potatoes were examined before being removed from the ground, and it was found that on the average the potatoes in the rows in which the tubers had been planted one inch below the surface were 2.3 inches deep: in the rows in which the tubers were placed three inches below the surface, 2 9 inches; in the rows in which the tubers were planted five inches below the surface, 4.1 inches deep; and in the rows in which the tubers were planted seven inches below the surface, 6 inches deep.

It was observed that a good many of the potatoes in the plots which were planted shallow or near the surface became badly sunburned, while in the plots where the tubers were planted deeper there was almost none of the crop which appeared in view of the surface of the ground. By a careful counting it was found that from planting one inch deep 84.6 per cent. of the hills had one or more potatoes exposed; from planting three inches deep, 38.4 per cent.; from planting five inches deep, 9.4 per cent., and from planting seven inches deep, 5.3 per cent.

Potatoes, Different Preparation of Seed Tubers.

This experiment was carried on in duplicate in 1892, in duplicate in 1893, and in triplicate in 1894, for the purpose of ascertaining what influence the different preparations of the seed tubers would have upon the production of the crop of potatoes. There were ten plots in each section of the experiment. The quantity of seed per acre varied with the manner of preparing the seed. The preparation of the soil, including manuring, etc., was precisely the same as used for the comparative tests of the different varieties previously mentioned. Each plot consisted of one row 4 rods long and $3\frac{1}{3}$ links (26.4 inches) between each two rows. Planting in 1894 took place on June 5th. Great care was exercised in the selection of the seed potatoes for each of the component parts of this experiment. Following are the results in tabulated form:

Preparation.	Yield per acre—whole crop.		Yield per acre, less seed used.		Percentage of whole crop marketable.	
	1894.	Average 3 years, 1892-3-4.	1894.	Average 3 years, 1892-3-4.	1894.	Average 3 years. 1892-3-4.
	bush.	bush.	bush.	bush.		
Large, whole, 1 foot apart	462.92	319.17	241.27	157.29	87.57	81.46
" " 2 feet "	357.08	242.36	247.48	158.16	90 32	86.91
" " 3 " "	322.50	199.90	251.25	147.48	93.62	90.21
Medium " 1 foot "	381.25	265 95	290.00	193.00	88.50	84 97
" " 2 feet "	327.50	202.10	282.50	165 63	93 86	89.75
Small " 1 foot "	352.50	208.37	322.10	180.90	92.65	88 68
Medium, cut in two, 1 foot apart	373.75	191.12	329.50	151.83	94.75	87.18
Medium, two eyes in a piece, 1 foot apart, without seed ends	303.75	158.65	289.85	143.95	97.44	91.75
Medium, one eye in a piece, 1 foot apart, without seed ends	187.08	92.09	179.58	83.93	98.01	90.87
Medium, seed ends, 1 foot apart	261.67	111.89	256 47	105.49	97.46	85.95

The largest yield per acre during each of the three years in which this experiment has been conducted was produced by planting large whole potatoes one foot apart. This, however, required a large amount of seed, and after the seed was subtracted from the produce of the plots, the largest yield per acre then remaining was from medium-sized whole potatoes, one foot apart, in each of the years 1892, 1893 and 1894. The smallest average yield per acre, less the seed used, was from planting medium-sized potatoes cut to one eye in a piece and planted one foot apart. The lowest percentage of small potatoes was produced from the medium sized potatoes cut to two eyes in a piece and planted one foot apart, while the highest percentage of small potatoes was produced by planting large whole potatoes one foot apart. This experiment caused much interest during the summer season, and was witnessed by many hundreds of people who visited the experimental department. The vines of the whole large potatoes were very strong and vigorous, while those of the sets with one and two eyes in a piece were much smaller, and those from the seed ends the smallest of all.

Potatoes, Application of Fertilizers.

In 1894 we carried on an experiment for the third time in applying different fertilizers to the potato ground. The fertilizers were the same in number and quality during each of the three years in which this experiment has been carried on. In 1892 and 1893 the potatoes were grown in the field to the southeast of the College building, and which was rather low in aspect. In 1894 the potatoes were grown in the central part of the experimental field, which lies to the northeast of the College building. The land is more elevated in the latter instances than that used previously. The experiment was conducted in duplicate in 1894, one set on the soil which grew a crop of spring wheat in 1893, and the other on soil which grew fodder crops during that season. No manure had been applied to the land for some years. The plots were $\frac{1}{100}$ of a acre in size. The drills were $3\frac{1}{3}$ links apart, and the potato sets were planted one foot apart in the drills. The tubers were cut to two eyes in a piece and were covered to the depth of about four inches. There were three rows in each plot, and one row was left unfertilized between each two plots. Planting took place on May 31st, and the fertilizers were sown in the drills after the seed had been dropped, but before it was covered. The nitrate of soda and the muriate of potash were each used at the rate of 160 lb. per acre; wood-ashes, unleached, 800 lb. per acre, and all the other fertilizers at the rate of 325 lb. per acre. The table following shows the results:

Fertilizers.	Percentage of crop marketable, 1894.	Weight of 30 best developed potatoes.	Yield of potatoes per acre. 1892.	1893.	1894.	Average for 1892-3-4.
		lb.	bush.	bush.	bush.	bush.
1 Royal Canadian	95.47	17.50	208.7	113.3	193.54	**171.85**
2 Potato manure	95.76	15.50	178.3	109.2	177.29	**154.96**
3 Superphosphate (animal)	95.62	16.50	159.6	104.2	174.17	**145.99**
4 Bone and potash	95.31	17.38	154.2	96.7	174.79	**141.93**
5 Sure Growth	95.02	17.00	123.8	89.6	197.92	**137.11**
6 Superphosphate (mineral)	93.43	16.50	147.1	74.6	186.25	**136.02**
7 Reliance	95.28	17.00	135.0	90.8	179.17	**134.99**
8 Muriate of potash	95.05	15.75	116.3	80.0	205.00	**133.80**
9 Pure bone meal	94.91	17.50	154.6	82.5	161.25	**132.82**
10 Capelton	96.05	17.13	124.6	84.6	172.92	**127.37**
11 Nitrate of soda	95.69	17.13	127.5	82.5	171.67	**127.22**
12 Wood ashes	95.74	17.38	122.1	84.2	166.25	**124.22**
13 Victor	95.81	17.00	111.3	77.5	171.67	**120.16**
14 No fertilizer	95.81	18.00	105.0	72.1	165.42	**114.21**

It will be observed from the table above that the highest yield per acre was produced by the Royal Canadian in 1892 and in 1893, while in 1894 this fertilizer gave the third highest yield per acre, it being surpassed during the past season by the muriate of potash and Sure Growth fertilizers. It will also be observed that the lowest yield per acre in 1892 and 1893 was from the unfertilized plot, while in 1894 the unfertilized produced the second lowest average yield per acre. In percentage of marketable potatoes there is but very little difference in the produce of the various fertilizers used. The crop of potatoes was increased 98.8 per cent. in 1892, 57.1 per cent. in 1893 and 17 per cent. in 1894 by the application of 325 lb. per acre of the Royal Canadian fertilizer. This fertilizer cost us about $38 per ton.

Potatoes, Rural Trench System.

Some very large yields of potatoes have been grown in the United States with the mode of culture known as the Rural Trench System. By this method trenches are made from ten to twelve inches in width and about a foot in depth by completely removing the soil. The soil is then returned in the trenches with or without the use of fertilizers or manure until the trenches are one-half to two-thirds full. The potatoes are then planted and the remainder of the soil is placed in the trenches. The test was conducted in 1894 in our experimental department to compare the advantages of using the trench without manure and with manure in comparison with our ordinary method of cultivation. Sixteen trenches were made, each being one foot wide by one foot deep and four rods long. Trenches were three feet from centre to centre. When the potatoes were planted the soil was thrown loosely in the trenches until they were two-thirds full.

The potatoes were then planted and the remaining portion of the soil placed in the trenches. Each plot consisted of two rows. In one plot farmyard manure was used at the rate of 20 tons per acre. This was mixed with soil, one half being below the potatoes and one half above the potatoes. In another plot the same quantity of farmyard manure was used and in addition potato fertilizer at the rate of 1,000 lb. per acre. On another plot, the potato fertilizer alone was used at the rate of 1,000 lb. per acre. This was mixed through the soil as described in the case of the farmyard manure. One plot of trenches was left unfertilized and in the case of another plot drills were made four inches deep by means of a double mould-board plow. In this case no trenches were made or any manure or fertilizers used. This plot is similar to all those used with the variety tests in the experimental department. This whole experiment was conducted in duplicate. The results were as follows :

Fertilizer.	Amount of fertilizer used.	Yield of whole crop per acre.
		bush.
1 Farmyard manure	20 tons per acre	403 34
2 Potato fertilizer and manure	1,000 lb. P. F. + 20 tons M.	360 02
3 Ordinary method		335.27
4 Potato fertilizer	1,000 lb	329.54
5 No fertilzer		312.82

The Trench System with the application of farmyard manure at the rate of 20 tons per acre gave the highest yield of potatoes, which was 68 bushels per acre more than that obtained from our ordinary method of cultivation. This, however, was due to the manure used, as the trenches which received no manure or fertilizers, gave the smallest yield per acre of all the plots in the experiment. Other seasons, however, may change these results to a large extent. The potato fertilizer did not seem to increase the crop to any great extent, but the land upon which the experiment was conducted was in a good state of fertility.

POTATOES, DIFFERENT DISTANCES IN PLANTING POTATO SETS EACH CONTAINING ONE EYE.

An experiment was conducted in 1894 in which potato sets containing one eye in each set and cut from medium-sized potatoes were planted at 4, 8, and 12 inches apart in the drill. The experiment was conducted in triplicate by using the Empire State, Rural New Yorker No. 2, and the N. B. & G. Co.'s Grand Mogul for the separate tests. The conditions regarding the soil were the same as those in the variety experiments with potatoes. Planting took place on June 7th. Following are the results :

Distance between sets.	Percentage of crop marketable.	Weight of 30 large potatoes.	Yield of whole crop per acre.
		lb	bushels.
4 inches	98.24	16.08	477.50
8 "	98.67	20.50	401.67
12 "	98.70	22.50	351.67

The largest yield per acre was obtained from planting the sets 4 inches apart in the row, the second best from 8 inches apart, and the poorest by allowing 12 inches between the potato sets. By planting the sets 4 inches apart there was an increase of 126 bushels per acre more than was produced by planting one foot apart. It will be observed, however, that there were not so many large-sized potatoes. The 30 best developed potatoes from planting 12 inches apart weighed 32 5 lb , while those planted 4 inches apart weighed only 16.1 lb. The percentage of small potatoes, however, in the whole crop was very similar when the different parts of the experiment are compared. The yield was high throughout.

POTATOES, INFLUENCE OF PLASTER AND LIME WHEN SPRINKLED ON FRESHLY CUT SETS.

It is a custom among some farmers and among a good many seedsmen to sprinkle the potato sets with plaster or sometimes lime immediately after they are cut. To determine the influence of sprinkling this way an experiment was carried on in 1894, in which medium-sized potatoes were cut to one eye in a piece. These sets were carefully divided into nine different lots with an equal number in each lot and in such a way that the lots were all similar in weight. Three of the lots were then sprinkled with plaster, three others were sprinkled with lime and the remaining three were left unsprinkled. The sets were kept in the cellar for three days, and were then planted in rows $3\frac{1}{3}$ links apart, the sets being placed 12 inches apart in the row. The three lots in each section of the experiment were planted separately so that the experiment was carried on in triplicate. Planting took place on June 5th, and the same methods of cultivation were used in this experiment as with the potatoes in the variety tests previously mentioned.

Methods of planting.	Weight of thirty large potatoes.	Yield of whole crop per acre.
	lb.	bush.
Potatoes sprinkled with plaster	29.13	398.96
" " lime	28.38	394 38
Potatoes not sprinkled	25.38	312.09

The potatoes sprinkled with plaster gave an average of 399 bushels per acre. Those sprinkled with lime gave about 5 bushels per acre less, and those left unsprinkled gave 86 bushels per acre less. This points to an advantage in sprinkling the potato sets with either plaster or lime if it is intended to send them through the mail or to keep them a few days before planting, after being cut. This experiment will likely be repeated in the future.

Potatoes, Planting Single Eye from Different Parts of the Seed Tuber.

It is often stated that the seed end or small end of the potato should be removed from the potato and thrown away instead of being used for seed. An experiment was carried on in order to try to determine whether each separate eye in the seed end of the potato had as much value for planting as the single eyes from other parts of the same potatoes. To determine this a uniform lot of potatoes were selected and single eyes were cut from the seed end, from the middle, and from the stem end of the tubers. In dividing up the seed into about three sets, one eye in each set was taken from each potato, the other eyes being thrown away. They were cut in such a way that a certain number of sets from the seed end of the potato would weigh exactly the same as the same number of sets from the middle or stem end of the potatoes. As great care was exercised in preparing this seed, the results should tend to show the difference in the strength of the individual eyes from the different parts of the potato. The potatoes were planted on the 5th of June in rows 26.4 inches apart, and the sets were planted twelve inches apart in the row. They were covered to a depth of four inches and flat cultivation was used throughout, as in the case of the other potato experiments.

The following table gives the average results of this experiment, which was carried on six times in 1894 :

Methods of planting.	Weight of thirty large potatoes.	Yield of whole crop per acre.
	lb.	bush.
Middle of potato	27 08	375.00
Stem end of potato	27.92	371.88
Seed end of potato	27.88	358.55

The eyes from the middle of the potato gave four bushels per acre more than those those from the stem end of the potato and sixteen bushels per acre more than those from the seed end of the potato. As the yield per acre was over 350 bushels in every instance, the difference between the yields might be considered quite close, and still they point towards the conclusion that the single eyes in the seed end of the potato were not quite so productive as those from the middle or stem end of the same potato. We have as yet, however, only one year's experience in this from which it is unsafe to draw any conclusion.

Potatoes, Single Eyes with Large and Small Amounts of the Tuber Attached.

In this experiment very large potatoes of as uniform size as possible were selected and all the eyes removed and thrown away but two of the strongest appearing ones on each potato. One of these eyes on each potato was then removed with a piece of the potato attached which would be about the size of a silver fifty cent piece, the remaining part of the potato being left attached to the other eye. It will be observed that the eyes of these two sets are similar in every respect except in the one particular, viz., that there was only a small amount of the fleshy part of the potato attached in one case ; while in the other there was large amount of the fleshy part of the potato attached to the eye. Planting took place on June 5th. The soil and methods of cultivation were similar, and the preparation of the soil and method of cultivation were the same as those used for the potatoes in the variety experiments.

Methods of planting.	Yield of whole crop per acre.
	bush.
Single eyes on large potatoes nearly whole........................	340.0
" small pieces taken from large potatoes	48.1

It will be seen in the average results of the duplicate experiment that the large sets of potatoes gave about seven times as large a yield per acre as was produced by small sets. In the latter case, however, the growth was exceedingly poor, as many of the sets did not grow. Just after planting there was a very dry season and this may account for the wide variation in the results, the small sets not having enough nourishment in themselves to carry them through the trying time until the rains again appeared. They seemed to dry up badly and lose their vitality, while, on the other hand, the large sets did not seem to be influenced to nearly so great an extent by the severity of the season. This, along with other experiments, goes to show that size of the seed tuber planted has a very marked influence upon the crop produced. It seems as if there more depends upon the size of the set planted than upon the number of eyes which the seed contains.

Swede Turnips, Comparative Test of 66 Varieties.

During the past year, sixty-six varieties of Swede turnips were grown side by side in the experimental grounds. The seed of these were obtained from England, United States and Canada. Of this number thirty varieties were grown for four years in succession, eight for three years, thirteen for two years, and fifteen were grown in 1894 for the first time on the experimental plots. The soil on which the seeds were sown was what might be termed an average clay loam, and was quite uniform throughout. It was cropped with oats in 1893, and received farmyard manure at the rate of twenty tons per acre in the spring of 1894, which was the first manure placed on this land for seven years. The land was plowed in the autumn and again before seeding time. Ridges were made three and one-third links apart with a double mould-board plow. Each drill was four rods long, and three of these drills were sown with one variety in every case. Each plot was, therefore, [illegible] of an acre in size. The seeding took place on June 21st, except numbers 64, 65 and 66, which were sown on June 25th. Great care was exercised in thinning the roots, which were left an average of one foot apart in the row in every instance.

Varieties.	Soundness of roots, 1894.	Results for 1894.			Average results for number of years grown.		
		Yield of tops per acre.	Average weight per root.	Yield of roots per acre.	Yield of tops per acre.	Average weight per root.	Yield of roots per acre.
Grown for four years:		tons.	lb.	tons.	tons.	lb.	tons.
1 Hartley's Bronze Top..........	medium	7.50	3.16	28.80	5.85	2.04	**23.08**
2 Marshall's Purple Top	medium-good ..	7.25	2.93	28.18	5.75	2.49	**21.89**
3 White Swede.........	" ..	10.15	3.03	28.95	6.38	2.42	**21.80**
4 P. W. & Co's. Imp'l Prize P. Top	medium	7.05	3.08	28.00	6 68	2.52	**21.59**
5 Skirving's Swede	medium-good ..	8.25	2 93	27.25	6.06	2.34	**21.50**
6 Carter's Prize Winner	" ..	7.75	2.73	24.55	6.13	2.35	**21.45**
7 Our Selected Purple Top	" ..	6.60	2 81	26.10	4.97	2.44	**21.38**
8 Carter's Imperial Hardy	" .	8.13	2.90	26.95	6.14	2.38	**21.31**
9 Hazard's Improved	medium-poor ..	7.38	2.74	26.70	5.41	2.49	**21.05**
10 Bangholm	medium	6.75	2.49	22.65	6.15	2.32	**20.60**
11 Westbury's Improved..........	" ..	6.50	2 42	22.50	6.76	2.29	**20.56**
12 Sutton's Champion	medium-good ..	6.45	2.40	22.45	5.24	2.38	**20.51**
13 Sharpe's Improved	" ..	6.40	2.59	24 65	4 92	2 20	**20.50**
14 Green Top	medium	6.25	2 23	20 45	6.99	2 29	**20.19**
15 Hall's Westbury	medium-poor ..	4 98	2.63	24.75	4.73	2.20	**20.00**

Swede Turnips, Comparative Test of 66 Varieties.—*Continued.*

Varieties.	Soundness of roots, 1894.	Results for 1894. Yield of tops per acre.	Average weight per root.	Yield of roots per acre.	Average results for number of years grown. Yield of tops per acre.	Average weight per root.	Yield of roots per acre.
Grown for four years:		tons.	lb.	tons.	tons.	lb.	tons.
16 Laing's Improved	medium-poor	6.75	2.28	21.40	5.80	2.15	19.82
17 Knowfield	medium-good	6.03	2.47	22.83	4.98	2.28	19.82
18 East Lothian	poor	6.50	2.60	24.20	5.54	2.25	19.69
19 King of Swedes	medium-poor	5.55	2.35	21.83	5.56	2.24	19.57
20 Highland Prize Purple Top	medium	6 70	2.33	21.30	5.94	2.23	19.42
21 Drummond's Imperial	medium poor	7.48	2 63	25.25	5.77	2.24	19.42
22 Royal Norfolk Purple Top	medium	6.65	2.41	22.15	4.61	2.19	19.04
23 Carter's Elephant	"	7.45	2.43	23.30	5.53	2.24	18.96
24 Fettecairn Green Top	"	6.45	2 69	24 08	5.31	2.29	18.58
25 Marquis of Lorne Purple Top	poor	6 83	2.53	24.13	5.17	2.15	18.52
26 Maston's Purple Top	"	5.23	2.11	19.03	5.34	2.03	18.29
27 Budlong White Ruta Baga	"	6.33	2.36	23 35	4.21	1.91	18.19
28 White Rock	medium	6.70	2 49	28.80	4.59	1.95	18.03
29 White Sweet Russian	medium-poor	7.50	2.44	24.08	5.46	1.99	17.92
30 Ashcroft's Purple Top	medium	7.93	2.48	23.90	5.00	2.09	17.63
Grown for three years:							
31 American Purple Top	medium	6.15	2 78	26.30	4.97	2 31	23.03
32 Queen of Swedes	medium-good	6.75	2.70	25 88	5.78	2 27	22.26
33 Edina	poor	9.05	2.50	23.10	8.04	2.27	21.72
34 Crimson King	medium-good	7.50	3 03	27.90	5.75	2.22	20.89
35 Shamrock Swede	medium	8.48	2.61	24.18	6.11	2.16	20.41
36 Laidlaw's Improved	"	7.35	2 45	24.18	5 63	2.08	20.13
37 Rennie's Prize Purple Top	"	7.90	2.94	26.60	5.95	2.27	20.13
38 Aroostock's Ruta Baga	"	6.70	2.14	20.85	5.95	1.95	19.38
Grown for two years:							
39 Kangaroo	medium good	7.73	2.94	27.50	6.21	2.55	24.27
40 Bloomsdale	"	8.80	2.72	26.20	6.98	2.37	23.10
41 N. B. & G. Co's. Prize Winner.	medium	8.60	2.95	28.30	6.48	2.44	22.40
42 Scottish Champion	medium-good	8.75	2.68	24.90	6.63	2.25	22.03
43 Hurst's Monarch	medium	8.00	2.75	25.75	6.19	2.32	21.98
44 Improv'd Long Island Ruta Baga	"	5.80	2.65	24.50	5.40	2.22	21.34
45 Jumbo or Monarch	medium-good	7.65	2.74	24.90	6.14	2.30	21.25
46 Jarman's Improved King of the West Purple Top	medium	9 00	2.75	25.95	6.42	2.30	21.22
47 Maule's Heavy Cropping	"	7.95	2.64	24.80	5.84	2.22	20.14
48 Sweet German Ruta Baga or Swedish	medium-good	9.08	2.68	24.83	7.67	2 09	19.73
49 White French	medium-poor	7.45	2.38	22.45	6.95	2.04	19.00
50 Thorp's Improved Shipping	medium	6.73	2.23	20.93	5.49	2.00	18.89
51 Premier	"	5.95	2.22	20.95	5.14	1.92	18.07
Grown for one year:							
52 Buckbee's Giant	good	9.55	3.16	30.95	9.55	3.16	30.95
53 Waite's Improved	medium	6.45	2.76	26.10	6.45	2.76	26.10
54 Halewood's Bronze Top	"	6.15	2.60	25.35	6.15	2.60	25.35
55 New American Yellow	"	6.38	2.67	24.85	6 38	2.67	24.85
56 Keith's Green Top	"	7.55	2.66	24 05	7 55	2.66	24.05
57 Dreer's Improved Purple Top	medium-good	5.00	2.35	23.25	5.00	2.35	23.25
58 Crosse's Improved	"	7.75	2.32	22 60	7.75	2.32	22.60
59 Swirving's Liverpool	medium-poor	5.75	2.42	22.35	5.75	2.42	22.35
60 Waite's London	medium	9.20	2.45	20.80	9.20	2.45	20.80
61 Improved American Purple Top	"	5.70	2.34	20.25	5.70	2.34	20.25
62 Mammoth Russian	"	5.35	2.11	20.05	5.35	2.11	20.05
63 Burpee's Breadstone	medium-poor	4.20	1.98	18.00	4.20	1.98	18.00
64 American Breadstone	medium	3.60	1.84	16.35	3.60	1.84	16.35
65 Sweet German	medium-poor	2.78	1.49	13.35	2.78	1.49	13.35
66 Burpee's Improved Purple Top Ruta Baga	medium-good	8.50	.58	5.38	8.50	.58	5 38

The Hartley's Bronze Top still heads the list in average yield per acre for four years among the thirty varieties grown for that length of time. Not only does it stand high in its average for the last four years, but it will be observed that in yield of roots per acre in 1894, it was surpassed by only two other varieties, namely, Buckbee's Giant, which gave 30.95 tons per acre, and the White Swede, which gave 28.95 tons per acre. Hartley's Bronze Top also headed the list in the average of nineteen co operative experiments carried on over Ontario with three varieties of Swedes in 1893, and stood second in the co-operative tests over Ontario in 1894 among three varieties tested in eighteen different localities. The American Purple Top which was mentioned in the 1892 report as Novelty Swede No. 2. heads the list among eight varieties grown for three years. The Kangaroo has not only given the highest average yield among thirteen varieties grown for two years, but it also gave a yield of 27.5 tons per acre in 1894. The Buckbee's Giant which was grown during the past season for the first time surpassed all other varieties in yield of roots per acre. It will be noticed that the White Swede gave the largest yield of tops per acre, and that the Sweet German gave the smallest amount of tops per acre among the sixty-six varieties grown in 1894.

Swedes, Thinning Plants in the Drill.

This experiment was conducted in 1894 for the third year in succession. It was carried on in duplicate each season. The experiment consisted in leaving the plants unthinned and in thinning to four, eight, twelve, sixteen and twenty inches in the drill, the drills being the same distance apart in every instance. The land used for the experiment in 1894 was a clay loam which produced a crop of oats in 1893, and was manured at the rate of twenty tons of farmyard manure per acre in the spring of 1894. The land was plowed in the autumn and again before the roots were sown. Slight ridges were made with double mould-board plow and the seed was sown on June 23rd. The plants were thinned when about two inches high and left to the distance required for the experiment. The results were:

Distance between roots in the drill.	Yield of tops per acre.		Average weight per root.		Yield of roots per acre.	
	1894.	Average, 3 years, 1892-3-4.	1894.	Average 3 years, 1892-3-4.	1894.	Average 3 years, 1892-3-4.
	tons.	tons.	lb.	lb.	tons.	tons.
Unthinned	9.25	7.24	.46	.33	22 60	13.57
4 inches	9 30	....	1.06	....	27.78	....
8 "	7.95	6.21	2.07	1.66	29 75	21 67
12 "	8.70	5.90	2.79	2 08	27.25	19.20
16 "	7.95	5.54	3.76	2 77	27.10	19.10
20 "	7 60	5.29	4.24	3.05	25.00	17.13

In the above average results for 1894 it will be observed that the roots which were thinned to eight inches apart in the row gave the largest average yield, producing 29.75 tons per acre. The largest yield per acre in 1892 was also produced from thinning to eight inches apart, and in 1893 the roots thinned to eight inches apart were surpassed by those thinned to six inches apart by only $\frac{1}{100}$ of a ton per acre.

It will be observed that these results are very uniform, and all pointing to the high yield produced by thinning the roots to eight inches apart in the row. If we look at the average of the past three years we notice roots thinned to eight inches produced $3\frac{1}{2}$ tons per acre more than those thinned to twenty inches, but, at the same time, it will be observed that the average weight per root of those thinned to twenty inches was nearly double that of those thinned to eight inches. It therefore resolves itself into a question of whether it is more desirable to grow a large yield and have smaller roots or produce a smaller yield and have larger sized roots.

The table is worthy of careful study, and a person can determine which thinning would best suit his conditions, after considering the relative importance of farm help and of cultivated land at his disposal.

Swede Turnips, Different Distance Between Drills.

This experiment was conducted in duplicate in 1892, in 1893, and in 1894, the object being to determine whether drills twenty, twenty-six, or thirty-two inches apart would give the best results with Swede turnips. The roots were all thinned to twelve inches apart in the row. The preparation of the land, including manuring, etc, was the same as mentioned in the experiment with thinning plants in the drills. Seeding took place on June 23. The results are contained in the following table :

Distances between drills.	Yield of tops per acre.		Average weight per root.		Yield of roots per acre.	
	1894.	Average 3 years, 1892-3-4.	1894.	Average 3 years, 1892-3-4.	1894.	Average 3 years, 1892-3-4.
	tons.	tons.	lb.	lb.	tons.	tons.
20 inches	7.99	5.88	2.07	1.68	26 66	19.46
26 "	8.00	6.03	2.67	2.10	26 87	18.98
32 "	8.34	5 69	3 06	2 31	24.81	17.48

When studying the results of this experiment it would also be well to study the results of the experiments that follow, which relate to the growing of fall turnips, mangels and carrots on drills different distances apart. It would also be well to observe the results of this experiment with the previous one, in which the roots are thinned to different distances in the drills.

It will be observed that in the average of the three years' experiments the Swede turnips sown on drills twenty inches apart there are two tons of roots per acre more than where the Swede turnips were sown on drills 32 inches apart; but, at the same time, it is important to observe that the roots in the latter case average 2.3 pounds each, while those in the former averaged only 1.7 pounds each.

Fall Turnips, Comparative Test of 43 Varieties.

During the past season forty-three varieties of fall turnips were grown in the experimental department. Of this number thirteen were grown for four years, two for three years, eighteen for two years, and ten were grown for the first time in 1894. Fall turnips are frequently known as the white and yellow-fleshed turnips. The seed was sown on land which was an average clay loam in character, and quite uniform throughout. It had produced a crop of oats in 1893, and received farmyard manure at the rate of twenty tons per acre in the spring of 1894. Plowing had been done in the autumn after the oats had been removed and in the spring before the turnip seed was sown. After plowing the land was well cultivated and slightly ridged with a double mould-board plow into rows 3⅓ links (26.4 inches) apart. Seeding took place on June 25th, except numbers 35 and 40, which were along with the varieties of Swede turnips, and were sown four days earlier. When the plants were about two inches in height they were thinned to twelve inches apart.

FALL TURNIPS, COMPARATIVE TEST OF 43 VARIETIES.—*Continued.*

Varieties.	Soundness of roots 1894.	Color of roots.	Results for 1894. Yield of tops per acre.	Results for 1894. Average weight per root.	Results for 1894. Yield of roots per acre.	Average results for number of years grown on plots. Yield of tops per acre.	Average results for number of years grown on plots. Average weight per root.	Average results for number of years grown on plots. Yield of roots per acre.
Grown for four years:			tons.	oz.	tons.	tons.	oz.	tons.
1 Jersey Navet	Medium	White	13.45	2 86	27.20	6.53	2.69	**24.21**
2 Early American Purple Top	"	"	10.60	2.69	26.20	6.27	2.47	**23.61**
3 Early Purple Top Munick	"	"	8.55	2.57	25.48	4.08	2.38	**22.71**
4 Purple Top Mammoth	Medium-good.	"	10.55	2.66	26.30	6.98	2 50	**21.68**
5 Greystone Improved	Good	"	13.20	2.03	19.23	8.06	2.63	**21.08**
6 Red Top Strap Leaf	Medium	"	6.50	2.16	21.28	4.72	2 22	**21.00**
7 Red Globe Norfolk	Good	"	11.25	1.87	18.30	6.97	2.34	**20.82**
8 Pomeranian White Globe	Medium-good.	"	12.00	2.60	24.55	8 20	2.27	**20.71**
9 White Stone	Poor	"	8.00	1.85	18.10	4.69	2.11	**17.45**
10 Orange Jelly	Medium	Yellow	8.15	1.57	15.50	4.33	1.90	**15.68**
11 Golden Ball	"	"	8 00	1.57	15.15	5.53	1.77	**14.60**
12 Yellow Aberdeen Purple Top	Good	"	10.35	1.67	16.20	6.10	1.60	**13.13**
13 Yellow Aberdeen Green Top	"	"	9.00	1.57	14.10	5.15	1.60	**13.12**
Grown for three years:								
14 Imperial Green Globe	"	White	8.55	1.65	16.35	5.14	1.66	**15.68**
15 Purple Top Hybrid	"	Yellow	7.75	1.63	14.25	5.31	1.38	**10.57**
Grown for two years:								
16 Cow Horn	Medium-good.	White	7.10	2.53	25.00	5.33	2.42	**24.95**
17 Green Barrell	Medium	"	7.80	2.33	22.45	6.85	2.27	**22.28**
18 Jarman's Improved Green Top Yellow Scotch	Good	Yellow	9.40	2.16	20.75	7.33	2.13	**21.14**
19 White Flat Dutch Strap Leaf	Medium	White	8.40	1.62	15.20	6.45	2.04	**20.99**
20 Yellowstone	"	Yellow	6.60	2.33	22.10	4.85	2.10	**20.74**
21 Yellow Montgomery	Good	"	14.70	2.37	23.30	8.72	2.04	**20.58**
22 Jersey Lily	"	White	10.60	2.09	19.90	8.30	2.17	**20.08**
23 Early White Model	Poor	"	5.50	2.11	18.95	4.49	2.02	**19.10**
24 Extra Early Milan	Medium	"	2.58	2.00	20 35	1.97	1.87	**18.80**
25 Jarman's Selected Green Globe	"	"	6 50	1.80	16.70	4.89	1.80	**16.79**
26 Sutton's Imperial Green Globe	Good	"	7.13	2.03	19.80	5.02	1.75	**16.68**
27 White Six Weeks	Medium	"	7.13	1.82	18.05	5.19	1.81	**16.00**
28 Dale's Hybrid	Medium-good.	Yellow	10.15	1.61	15.90	7.33	1.49	**14.73**
29 Amber Globe	Medium	"	7.45	1.74	16.70	5.88	1.58	**14.60**
30 Early Maltese	Medium-poor.	"	4.43	1.22	11.85	3.79	1.38	**13.83**
31 Fosterton Hybrid	" good.	"	6.50	1.16	10.55	6 65	1.32	**12.28**
32 Carter's Champion Green Top Scotch or Aberdeen Hybrid.	Good	"	7.65	1.02	9.85	5.75	1.13	**9 33**
33 Seven Top	"	White	8.50	.73	6.10	7.35	.85	**8.08**
Grown for one year.								
34 White Egg	"	"	11.45	3.90	36.25	11.45	3.90	**36.25**
35 Purple Top Mammoth	Medium-good.	"	12.50	3.07	29.30	12.50	3.07	**29.30**
36 White Lilly	Good	"	10.05	2.60	25.63	10.05	2.60	**25.63**
37 Milk Globe	"	"	14.25	2.39	23 50	14.25	2.39	**23.50**
38 Orange Sweet	Medium-good.	Yellow	9.05	1.98	19.15	9.05	1.98	**19.15**
39 Early LaCrosse	Good	White	13.33	1.71	16.70	13 33	1.71	**16.70**
40 All Gold	Medium good.	Yellow	7.25	1.90	17.60	7.25	1.90	**17.60**
41 Beck's Early Golden Stone	Good	"	3 50	2.72	8.70	3 50	2.72	**8.70**
42 Beck's Improved Early Green Top	Medium-good.	"	2.45	2 28	7.40	2.45	2.28	**7.40**
43 Small Berlin	Good	White	.60	.33	2.75	.60	.33	**2.75**

The *Jersey Navet* heads the list in average yield of roots per acre among thirteen varieties grown side by side for four years. Not only did this variety give the largest average yield per acre for the number of years mentioned, but it also stands second in yield per acre, among the forty-three varieties grown in 1894. In 1893, it gave the largest yield per acre among two varieties tested in nineteen different localities over Ontario, and in 1894 it also gave the largest yield per acre of two varieties tested in eighteen different localities over Ontario. The seed of this variety was imported from the United States in the spring of 1890. The *Red Globe Norfolk*, which was at one time considered one of the most productive varieties, now stands seventh in yield per acre among thirteen varieties grown for four years. The *Early American Purple Top* comes next to the Jersey Navet in productiveness; but in keeping quality, it is quite inferior to that variety. The *Imperial Green Globe* which heads the list in yield among two varieties grown for three years, produces roots of excellent quality. They are early, round, uniform, and should be well adapted for shipping purposes to supply the early market.

The *White Egg* variety which was grown in the experimental department in 1894 for the first time, gave the largest yield per acre among forty-three varieties tested. This variety gave nine tons per acre more than the Jersey Navet which stands next in point of yield. The average weight per root was one pound heavier than that of the Jersey Navet.

Fall Turnips, Thinning Plants in the Drill.

A duplicate experiment was carried on in 1894 in growing fall turnips in different parts of the drill. This was a continuation of a similar test conducted in 1893, and also of one conducted in 1892. The land used for the experiment during the past year was a clay loam, which had been cropped with oats the previous year and manured in the spring of 1894 with farmyard manure at the rate of twenty tons per acre. The land was plowed in the autumn and also in the summer before sowing the turnips. Slight ridges were made by a double mould-board plow, and the seed was sown on June 23rd. The plants were thinned when about two inches high to the distance indicated in the table below.

Distance between plants in the drill.	Yield of tops per acre.		Average weight per root.		Yield of roots per acre.	
	1894.	Average 3 years 1892-3-4.	1894.	Average 3 years 1892-3-4.	1894.	Average 3 years 1892-3-4.
	tons.	tons.	lb.	lb.	tons.	tons.
Unthinned	18 75	13.90	.18	.30	20.37	16.26
4 inches	13.03	9.23	1.28	1.13	37.50	27 06
8 "	12.20	8.56	2.60	2.03	39.15	26.80
12 "	12.32	8.07	3.89	2.92	37.88	25.75
16 "	11.79	7.94	4.99	3.73	37.27	25.18
20 "	10.75	7.26	5.42	4.05	32.40	22.29

As in the case with the experiment in thinning Swede turnips at different distances, we find that the largest yield per acre of the fall turnips was produced by *thinning to eight inches* in the drill in 1894. In 1892 and 1893, however, the largest yield was produced by thinning to four inches in the drill and this accounts for there being one-fifth of a ton more per acre in the average of three years from thinning to four inches than from thinning to eight inches in the drill. It is, however, interesting to notice that as the distances increased between the plants left in the rows, the average size per root increased, while the yield per acre gradually decreased.

FALL TURNIPS, DIFFERENT DISTANCES BETWEEN DRILLS.

An experiment was carried on in 1894 for the first time by sowing fall turnips in drills twenty, twenty-six and thirty-two inches apart. The land on which this experiment was conducted was a good average clay loam, which produced a crop of oats in 1893, and which received farmyard manure at the rate of twenty tons per acre in the spring of 1894. This was the first manure the land had received for seven years. The soil was plowed in the autumn after the oat crop was removed and in the summer before the fall turnips were sown. The land was slightly ridged with a double mould-board plow; the drills being 26.4 inches apart in every instance. Each plot was $\frac{1}{10}$ of an acre in size and the experiment was conducted in duplicate.

The seeding took on June 23rd. The plants were thinned when about two inches high to the distance of twelve inches apart.

Distance between drills.	Yield of tops per acre, 1894.	Average weight per root.	Yield of roots per acre.
	tons.	lb.	tons.
20 inches	9.74	2.43	31.16
26 "	9.17	3.10	31.23
32 "	9.84	3.66	29.92

As this is the first year that this experiment was carried on with fall turnips, it is not wise to place much stress upon the results. The drills situated 26 inches apart have given a little larger average yield of roots per acre than those 20 or 32 inches apart. It will be observed that the tops of the fall turnips produced nearly one-third as great a weight per acre as the roots themselves.

MANGELS, COMPARATIVE TEST OF 57 VARIETIES.

There were 57 varieties of mangels grown on the plots during 1894; of that number, three were grown for four years, seven for three years, twelve for two years, and eight were grown in 1894 for the first time. The mangel seed was obtained from England, United States, Quebec and Ontario. The seed was sown on soil which was a little lighter in character than that used for the Swede turnips. The land had a slight slope towards the southwest, but was quite uniform throughout. It produced a grain crop in 1893, and in the spring of the present year received a dressing of twenty tons of farmyard manure per acre. The land was plowed after the grain crop was removed in the autumn, and again in the spring before the mangels were sown. The double mould-board plow was used to ridge slightly the surface into rows $3\frac{1}{3}$ links apart. Seeding took place on May 8th, except numbers 54 and 56, which were sown on May 9th. When the plants were about two inches high, they were thinned to a distance of 12 inches apart.

The yield of mangels per acre in 1894 was not large, but owing to the very dry weather during the past season for growth, the yield may be considered a fair one. Among 30 varieties grown for four years, the largest average yield of roots was produced by the *Evans' Improved Mammoth Sawlog*, giving 23 tons per acre, the yield for 1894 being two tons per acre less than the average. Not only does this variety stand at the head of the list in the average results, but it also gave the largest average yield of roots among the 57 varieties grown on the plots in 1894. It was followed by the *Norbitan Giant* with a yield of 20.3 tons per acre. The variety which produced the second largest yield for four years was the *Carter's Champion Yellow Intermediate*. It surpasses six varieties of long mangels which come immediately below it in yield per acre. The seed of the Carter's Champion Yellow Intermediate was imported from England, and a fresh supply has been used each season. The flesh of this variety is of a pinkish yellow, and the roots are fairly uniform throughout. Among the Globe varieties, the *Yellow Obendorf* has given the largest yield per acre for four years.

Varieties.	Color of root.	Average length of root, 1893-4.	Results for 1894. Yield of tops per acre.	Average weight per root.	Yield of roots per acre.	Average results for number of years grown. Yield of tops per acre.	Average weight per root.	Yield of roots per acre.
Grown for four years:			tons.	lb.	tons.	tons.	lb.	tons.
1 Evans' Improved Mammoth Sawlog	Red	10.9	4.90	2.12	21 00	4.05	2 17	22 89
2 Carter's Champion Yellow Intermediate	Yellow	9.3	2.60	1.63	16.13	3.36	2.16	22 79
3 Improved Mammoth Long Red	Red	12.3	4.10	1.97	19.55	3.99	2.08	22 72
4 Steele Bros.' Long Red Selected	Red	11.4	4.20	1.89	18.15	3.94	2 09	22.16
5 Elvethan Long Red	Red	11.5	4.20	1.90	18.95	4.46	1.85	21 82
6 Norbitan Giant	Red	10.4	4.65	2.03	20.30	3.99	2.05	21.38
7 Carter's Mammoth Long Red	Red	11.4	4.20	1.77	17.55	4.39	1.91	20.77
8 Eiffel Tower	Red	10.2	1 88	1.86	18.38	3.06	1.95	20.55
9 Mammoth Red Intermediate	Red	9.3	2.25	1.65	16.38	3.38	1.82	20 07
10 Yellow Obendorf	Yellow	8.5	4.28	1.65	16.45	3.20	1.73	19.63
11 New Monarch	Yellow	7.5	1.88	1.66	16 55	3.38	1 71	19.33
12 Colossal Long Red	Red	12.5	2 65	1.66	16.63	3.54	1.80	19.32
13 Giant Holstein	Red	11.1	2.70	1.48	14.30	3.67	1.77	18 69
14 Oblong Giant Yellow	Yellow	8 7	2.13	1.69	15.95	2.35	1.80	18.55
15 May's Mammoth Long Red	Red	10 8	2.50	1.56	15.40	4.11	1.68	18.16
16 Chirk Castle	Red	11.3	2.50	1.26	12.45	2.94	1.61	17.90
17 Long Oxhorn	Red	10.8	2.40	1.44	14.40	3.30	1.64	16.79
18 Yellow Oval-shaped Giant	Yellow	7.2	1.50	1.22	12.05	1.83	1.55	16.30
19 Carter's Warden Orange	Yellow	5.1	1.40	1.08	10.83	3.12	1.48	15.74
20 Mammoth Golden Giant	Yellow	8.4	2.65	1.64	16.25	3.01	1.51	15 35
21 Yellow Globe	Yellow	5.0	1.60	1.26	12.50	2.94	1.87	14 89
22 Red Oval-shaped Giant	Oval	8.1	1.33	1.21	12.05	1 97	1 53	14.73
23 Red Globe	Red	6.0	2.20	1.37	13.70	2.43	1.45	14.68
24 Golden Tankard	Yellow	6 1	1.60	1.32	12.58	1.95	1.36	14 27
25 Clark's Devon Orange Globe	Yellow	5.7	1.68	1.27	12.68	1.93	1.33	14.11
26 Fisher Hobbs' " "	Yellow	5 2	1.58	1.26	12.58	1.81	1.37	14.04
27 Kniver Yellow Globe	Yellow	6.2	1.35	1.36	13.50	1.70	1.34	13.88
28 Long Yellow	Yellow	11.2	1.25	1.16	11.50	2.26	1.47	13.77
29 Oblong Giant Red	Red	9.5	1.05	2 58	7 60	1.88	1.79	13 14
30 Red Tankard	Red	8.0	.65	2.01	7.65	1.39	1.49	11.69
Grown for three years:								
31 Sutton's Mammoth Long Red	Red	11.6	2.50	1.37	13.65	3.77	1.56	15 84
32 Canadian Giant	Red	11.1	2.05	1.16	11.45	3.12	1.31	13.21
33 Beck's Champion Globe	Red	8.9	1.83	1.10	11.03	2.24	1.27	12.60
34 Gate Post	Red	10.7	2.15	1.31	12.73	2.67	1.29	12.56
35 Sutton's Golden Tankard	Yellow	6.0	1.50	.99	9.75	2.14	1.22	12.33
36 Berkshire Prize Yellow Globe	Yellow	5 8	1.05	1.31	13 00	1.59	1.23	12.26
37 Sutton's Yellow Intermediate	Yellow	7.6	2 05	1.28	12.75	1.61	1 13	11.14
Grown for two years:								
38 Yellow Leviathan	Yellow	10.1	2.10	1.67	15 88	2.37	1.53	15.44
39 Giant Yellow Intermediate	Yellow	9.9	1.85	1.64	15.15	2.44	1.54	15.24
40 Jarman's Giant Long Red	Red	11.9	2.40	1.30	12.90	3.00	1 38	14 37
41 New Eschendorf	Yellow	6.2	1 45	1.47	13.23	1.82	1.41	13.97
42 Yellow Ovoid	Yellow	8.1	2.05	1.44	13.93	2 47	1.35	13.63
43 Sutton's Yellow Globe	Yellow	5.3	1.40	2.35	12.90	1.78	1.82	13 55
44 English Prize	Red	10.8	2.35	1.44	14.25	2.57	1.32	13.20
45 Jarman's Giant Intermediate	Yellow	6.6	.75	1.23	11.05	1.22	1.28	12.40
46 Olive-shaped Red	Red	6 3	2.03	1.28	12.53	2.01	1.18	12.24
47 Ward's Oval	Yellow	7.8	1.68	1 43	14.05	1.67	1.18	12 08
48 Jarman's Selected Golden Tankard	Golden	8.3	1.30	1.80	9.05	1.80	1.57	11.43
49 Jarman's Model Yellow Globe	Yellow	5.7	1.35	1.43	7.85	1.68	1.36	10.99
Grown for one year:								
50 Jumbo	Red	11.0	2.50	1.78	16.90	2.50	1.78	16.90
51 Carter's Warden Prize Yellow Globe	Red	10.0	2.50	1.48	14.50	2.50	1.48	14 50
52 Webb's New Kniver Yellow Globe	Yellow	7.0	1.15	1.33	13.15	1.15	1.33	13.15
53 Dignity	White	7.0	2.75	1.46	13.10	2.75	1.46	13.10
54 Cornish Yellow Globe	Yellow	5.0	.90	1.97	6.70	.90	1.97	6 70
55 Thorp's Own Yard Long	Red	12.0	1.65	1.91	6.68	1.65	1.91	6.68
56 Brock's Yellow Intermediate	Yellow	6.0	.75	1.86	5.50	.75	1.86	5.50
57 Thorp's Own Champion Yellow Inter	Yellow	7.0	.45	1 50	4.95	.45	1.50	4 95

Mangels, Thinning Plants in the Drill.

For three years in succession an experiment has been conducted in allowing mangels to remain unthinned in the drill, and thinning them to 4, 8, 12, 16 and 20 inches apart; and to make this experiment more complete, it was carried on in duplicate each of the years mentioned. There were none thinned to 4 inches apart in 1892. In 1894, this experiment was conducted on rather low-lying land, which contained a considerable amount of vegetable matter. It produced a crop of roots in 1893, and was manured at the rate of 20 tons per acre in the early spring of 1894, after which it was plowed. The land had also been previously plowed in the autumn. Before the mangel seed was sown, the land was slightly ridged with a double mould-board plow in rows 26.4 inches apart. Seeding took place on May 5th, and the plants were thinned to their proper distances when about two inches high.

Distance between roots in the drills.	Yield of tops per acre.		Average weight per root.		Yield of roots per acre.	
	1894.	Average 3 years, 1892-3-4.	1894.	Average 3 years, 1892-3-4.	1894.	Average 3 years, 1892-3-4.
	tons.	tons.	lb.	lb.	tons.	tons.
Unthinned	18.75	10.43	.69	.39	38.79	23.05
4 inches	13.08	....	1.50	....	39.80	....
8 "	10.53	6.03	2.46	1.60	37.85	24.00
12 "	9.76	5.25	3.12	2.03	35.90	22.14
16 "	8.90	4.92	3.73	2.42	33.85	20.39
20 "	7.48	4.37	3.96	2.69	29.10	18.74

The largest yield of mangels per acre was produced by thinning the roots to four inches apart in the drill in 1894, and also from thinning to that distance in 1893. In the corresponding experiment of 1892 there were none of the mangels left at four inches apart in the row, and in that year the largest yield was produced by thinning to eight inches. It will be observed that the largest yield of tops per acre was obtained from the roots that stood the thickest in the row, and as the distance between the roots increases, the yield of tops gradually decreases in yield per acre. The same holds good with the yield of roots per acre, with the exception of the unthinned plot.

Mangels, Different Distances Between Drills.

In this experiment, the mangels were grown upon drills 20, 26 and 32 inches apart. This experiment has been conducted for three years in succession, and it has been carried on in duplicate each year. The mangel seed was sown on the 5th of May, upon ridges made by a double mould-board plow 26.4 inches apart. Each plot was $\frac{1}{10}$ of an acre in size. The land was in good condition, having received a dressing of twenty tons of farmyard manure per acre in the spring of 1894, and having produced a crop of roots in 1893, which were removed from the land, and fed in the stables. The plants were thinned to twelve inches apart in the drill.

Distance between drills.	Yield of tops per acre.		Average weight per root.		Yield of tops per acre,	
	1894.	Average 3 years, 1892-3-4.	1894.	Average 3 years, 1892-3-4.	1894.	Average 3 years, 1892-3-4.
	tons.	tons.	lb	lb.	tons.	tons.
20 inches	6.01	4.31	2.58	1.83	33.46	24.20
26 "	5.87	4.55	3.10	2.15	30.45	22.26
32 "	6.89	4.74	3.56	2.45	28.98	21.12

In examining the average results for the past three years, we find that as the distance between the drills increased, the yield of tops per acre increased, the size of the individual roots increased, and the yield of roots per acre decreased. The weight of the tops of the mangels was about one-fifth of that of the roots.

CARROTS. COMPARATIVE TEST OF 47 VARIETIES.

Varieties.	Color of roots.	Shape of roots.	Length of roots (average).	Results for 1894.			Average results for number of years grown.		
				Yield of tops per acre.	Average weight per root.	Yield of roots per acre.	Yield of tops per acre.	Average weight per root.	Yield of roots per acre.
Grown for three years:			in.	tons.	oz.	tons.	tons.	oz.	tons.
1 Pearce's Improved Half Long White	White..	Cone	9	9.85	20.23	34.78	9.28	16.34	33.62
2 Steele Bros.' Improved Short White	White..	Cone	9	9.00	20.68	34.25	8.85	16.49	32.94
3 White Green Top Orthe	White..	Cone	10	8.65	19.96	34.75	7.84	15.32	31.20
4 Mastodon	White..	Cone	9	8.10	19.96	34.18	7.49	14.45	29.79
5 Large White Vosges	White..	Cone	8	7.05	17.58	29.45	6.93	14.06	28.93
6 Simmers' Short White Vosges	White..	Cone	7	6.43	16.01	27.53	6.37	13.27	26.92
7 Sutton's Yellow, Intermediate	Yellow.	Cone	9	7.48	17.86	31.25	6.65	13.15	26.08
8 Large White Belgian	White .	Long	15	6.65	15.09	25.00	7.20	12.50	25.39
9 Danver's Orange	Orange.	Cone	7	5.05	11.83	22.00	4.90	11.08	24.56
10 P. W. & Co.'s Improved Giant Wiltshire White	White..	Long	12	6.60	14.94	24.28	7.76	13.31	24.22
11 Giant Wiltshire	White..	Long	14	7.65	13.11	22.13	8.01	10.84	23.01
12 Guerande	Red....	Short	4	3.80	10.23	20.10	3.75	9.01	21.50
13 Mitchell's Perfected	Red....	Med. long	8	4.55	12.54	21.95	4.08	10.18	21.41
14 Carter's Orange Giant	Orange.	Long	10	6.93	15.09	26.40	4.56	11.90	20.05
15 French Intermediate	Red....	Short	8	4.25	10.08	18.65	4.92	8.56	19.80
16 Scarlet Intermediate	Red....	Med. long	6	3.60	9.84	16.30	4.16	8.88	19.04
17 Half Long Stump-Rooted	Red....	Short	7	2.98	8.72	16.55	2.91	8.17	18.74
18 Sutton's Improved Intermediate	Red....	Long	9	3.25	9.83	18.80	3.68	8.34	18.53
19 James' Scarlet Intermediate	Scarlet.	Half long.	8	3.60	10.00	17.35	3.77	7.93	17.92
20 Yellow Belgian	Yellow.	Long	12	6.18	10.97	17.83	5.25	8.46	16.06
21 Long Red Surrey	Yellow.	Long	12	5.85	10.88	17.00	4.37	7.63	15.48
22 Long Orange	Orange.	Long	11	4.83	7.99	13.98	6.39	6.93	14.81
23 Improved Large Long Red Altringham	Red....	Long	11	3.50	9.63	15.20	4.91	7.21	14.49
Grown for two years:									
24 Nichol's Improved Long Orange	Red....	Long	10	4.40	11.69	22.10	4.19	9.00	18.87
25 Rubicon Half Long	Red....	Short	5	5.13	11.02	20.00	4.26	8.51	18.12
26 Long Red St. Vallery	Red....	Long	10	4.45	11.15	21.95	3.90	8.63	17.88
27 Half Long Scarlet	Red....	Half long.	7	4.28	10.02	19.25	3.81	7.36	16.75
28 Nante's Half Long Stump-Rooted	Red....	Half long.	8	5.75	12.07	22.40	3.94	9.19	16.70
29 Chantenay	Red....	Half long.	6	3.40	11.79	15.70	3.13	8.60	15.24
30 New Long Red Coreless	Red....	Long	9	3.25	9.16	17.38	2.82	6.63	14.39
31 Red Parisian Forcing	Red....	Round ..	3	2.50	8.44	16.15	2.24	6.32	14.20
32 Small French Forcing	Red....	Short	4	1.65	6.07	11.85	1.30	5.14	10.47
33 Jarman's Scarlet Green Top	Red....	Long	9	1.60	16.14	5.70	2.30	11.22	9.07
Grown for one year:									
34 Iverson's Champion	White..	Cone	10	6.80	17.24	29.85	6.80	17.24	29.85
35 Mammoth Intermediate Smooth White	White..	Long ..	9	6.50	17.07	29.50	6.50	17.07	29.50
36 Simmer's Giant White	White..	Cone	8	5.00	12.43	25.25	5.00	12.43	25.25
37 Improved White Belgian	White.	Long	13	5.55	13.74	24.05	5.55	13.74	24.05
38 Midsummer	Red....	Short	6	3.20	9.62	19.13	3.20	9.62	19.13
39 Yellow Intermediate	Yellow.	Long	8	9.53	16.00	18.75	9.53	16.00	18.75
40 Victoria	Red....	Long	9	3.90	9.68	18.45	3.90	9.68	18.45
41 Yellow Giant	Yellow.	Long	12	3.80	10.87	16.65	3.80	10.87	16.65
42 Half Long Scarlet Carentian	Scarlet.	Half long.	6	1.90	7.26	14.18	1.90	7.26	14.18

Nine new varieties of carrots were grown in 1894 for the first time. This has increased the list until the number has now reached forty-seven. Twenty-three of these have been grown on the trial grounds for three years in succession, and ten have been grown during the past two years. The plots upon which the carrots were grown were uniform in shape throughout, and were $\frac{1}{100}$ of an acre in size. There were three rows, four rods long, in each plot, no extra space being allowed between the plots. The land was similar in character, and was prepared in the same way to that for the mangels, as previously described. The seed was sown on May 5th and 7th, except for number thirty-nine, which was sown on the 8th.

The crop of carrots in 1894 was very good indeed, as several of the plots gave upwards of thirty tons of roots per acre. The *Pearce's Improved Half Long White* heads the list in yield per acre, among twenty-three varieties grown for three years in succession. This variety has given an average of 33.6 tons per acre for that length of time, and is followed by the *Steele Bros'., Improved Short White* with an average of 32 9 tons per acre. The yield of the former in 1894 was 34.78 tons, and of the latter, 34.25 tons per acre. It will be observed that the six highest yielding varieties of carrots are all white fleshed. These varieties resemble one another very closely, and are all quite easily removed from the ground. The *Guerande* variety which stands twelfth on the list is a very short carrot and one of the easiest to harvest in the whole list. This was sent out along with some other varieties in 1893 and 1894, and has given very good satisfaction, although the yield is not equal to the *Improved Short White*, as the latter mentioned variety took the lead in yield per acre among the five varieties tested in 1892, in 1893, and also in 1894. Among the new varieties which were grown in 1894 for the first time, the *Iverson's Champion* heads the list with nearly thirty tons per acre. This is followed closely by the *Mammoth Intermediate Smooth White* with 25.9 tons per acre.

Carrots, Thinning Plants in the Drill.

An experiment was carried on in growing carrots at different distances apart in the drill, in 1892, in 1893 and again in 1894. The experiment each year was conducted in duplicate. The land used and the method of cultivation were the same in 1894 as mentioned in a similar experiment with mangels grown in the same year. The seed was sown on May 5th, and when the plants were about two inches high, some were left unthinned and others were thinned to 2, 4, 6, 8, and 10 inches apart as indicated in the following table :

——	Yield of tops per acre.		Average weight per root.		Yield of roots per acre.	
	1894.	Average 3 years, 1892-3-4.	1894.	Average 3 years, 1892-3-4.	1894.	Average 3 years, 1892-3-4.
	tons.	tons.	lb.	lb.	tons.	tons.
Unthinned	12.15	8.95	.55	.32	34.73	24.70
2 inches	9.78	7.70	1.07	.64	35.28	26.59
4 "	9 28	6.73	1.27	.86	35.83	24.47
6 "	7.88	5.86	1.62	1.06	32.63	21.50
8 "	7.25	5.17	1.97	1.27	29.83	19.22
10 "	6.08	....	1.99	....	25.93	

In the average of three years the largest yield of carrots was produced by leaving the plants to two inches in the drills, but according to the results of 1894, those thinned to four inches in the drill gave a very high increase in yield of roots per acre over those thinned to two inches. In 1892 there was no plot in the experiment in which carrots were thinned to ten inches apart. It is often claimed that larger yields per acre can be obtained by growing roots to a considerable distance apart than by leaving them remaining quite close in the drill. Each experiment during the three years does not point in this direction. but indicates that as the distance widens between the plants the crop diminishes in yield and the average weight per root increases.

Carrots, Different Distances Between Drills.

This experiment was conducted on land under exactly the same conditions as used for a corresponding experiment with mangels previously described. This experiment was also carried on in duplicate in 1892, 1893 and in 1894. The seed was sown on May 5th. When the plants were about two inches high, they were thinned to an average of four inches in the row. The following table gives the results of the experiment for 1894, and also the average results for the past three years :

Distance between drills.	Yield of tops per acre.		Average weight per root.		Yield of roots per acre.	
	1894.	Average 3 years, 1892-3-4.	1894.	Average 3 years, 1892-3-4.	1894.	Average 3 years, 1892-3-4.
	tons.	tons.	lb.	lb.	tons.	tons.
20 inches	8.70	7.00	1.18	.78	43.63	30.25
26 "	8.71	6 76	1.39	.90	41.02	28.07
32 "	8.26	6.15	1.51	.94	36.01	23.53

The results in the carrots throughout are very regular. As the distance between the drills increased, the yield of tops per acre decreased, but the weight per average root increased. The tops of the carrots weigh about one-quarter as much as the roots.

Roots, Selection of Seed.

Up to the year 1894, nothing had been done in comparing the different qualities of seed of turnips, mangels and carrots in relation to root production. During the past year we selected with great care some of the best developed seed, some of the medium seeds, and some of the seeds which were small and of inferior quality, of the following classes of roots : Swede turnips, fall turnips, mangels and carrots. The seed was selected in every case from about one pound of seed obtained from seedsmen in the spring of 1894. The quality of the seed from which the selection was made may be considered about the average of that which is used in general cultivation. The mangels and carrots were sown on May 9th, and the Swede and fall turnips on July 6th. The soil upon which the mangels and carrots were sown was rather low-lying and was manured in the spring of 1894. The seed was sown in rows $3\frac{1}{3}$ links apart. When the plants were about two inches high, the mangels were thinned to 12 inches in the row, and the carrots to four inches in the row.

The Swede and fall turnips were sown on land much more elevated than that used for the mangels and carrots. It had not received manure for several years and had produced a fodder crop in 1893.

The following table gives the average yield per acre from duplicate plots in sowing large, medium and small seed of Swede turnips, fall turnips, mangels and carrots.

Selection.	Yield of roots per acre.				
	Swede turnips.	Fall turnips.	Mangels.	Carrots.	Average of four classes of roots.
	tons.	tons.	tons.	tons.	tons.
Large	20.85	32.85	28.88	34.05	29.16
Medium	20.03	24.00	27.53	33.98	26.39
Small	2.33	10.50	17.03	25.35	13.80

From the above table, it will be seen that the largest yield per acre of Swede turnips, fall turnips, mangels and carrots was obtained from sowing large seed; the second highest yield in every instance was obtained from sowing medium sized seed, and the lowest yield per acre in every instance was from sowing the small seed. The seed used in every instance was all whole, every cracked seed being discarded. Great pains were used to have all conditions regarding this experiment as uniform as possible for each class of roots, with the single exception of the seed used. This table is worthy of careful study and may point to the reasons why we often see a very great variation in the different roots growing in the same field. The selection of the seed was made by sifting and hand-picking. It is really surprising to notice the large amount of small uniform seed that can frequently be sifted from a pound of root seed which has been purchased for sowing. The proper selection of seed is of very great importance, and a large amount of experimental work along this line will likely be conducted at the College in future.

Sugar Beets, Comparative Test of 13 Varieties.

Three varieties of sugar beets were grown upon the plots in 1894 for the first time. This makes the number of sugar beets now under experiment, thirteen. Ten of these varieties have been grown for three years. The soil on which this experiment was conducted was rather low-lying, and contained a considerable amount of vegetable matter. It also produced a crop of roots in 1893, and was manured in the spring of the present year with twenty tons of well-rotted farmyard manure per acre. The land was plowed both in the autumn and in the spring, and after thorough cultivation was slightly ridged with a double mould-board plow. The rows were three and a third links apart and four rods long. Three rows were used in each plot, with the exception of the New Danish Improved, in which case only one row was used, owing to a very limited quantity of seed. Seeding took place on May 8th, and after the plants were about two inches high they were thinned to twelve inches in the row.

Varieties.	Color of root.	Results for 1894.			Average results for number of years grown.		
		Yield of tops per acre.	Average weight per root.	Yield of roots per acre.	Yield of tops per acre.	Average weight per root.	Yield of roots per acre.
Grown for three years:		tons	lb.	tons.	tons	lb.	tons.
1 White Silesian	White	7.58	1.68	26.10	5.75	1.61	**18.89**
2 Red Top	Reddish	5.65	1.60	23.90	4.55	1.53	**18.15**
3 French White	White	7.55	1.67	25.00	4.79	1.52	**18.03**
4 Vilmorin's Improved White	White	5.55	1.51	23.35	5.40	1.44	**17.17**
5 Lane's Improved	Pinkish	3.80	1.55	23.20	3.39	1.41	**16.92**
6 Champion	White	5.10	1.51	22.30	4.35	1.35	**15.98**
7 Austria Electorial Wohanka	White	7.05	1.57	23.33	5.68	1.27	**15.26**
8 Kleinwanzelben	White	7.28	1.53	21.65	5.53	1.24	**14.48**
9 Red Skinned	Pinkish	4.25	1.41	19.70	3.66	1.08	**12.45**
10 Improved Imperial	White	3.60	3.26	11.40	3.77	1.97	**9.96**
Grown for one year:							
11 New Danish Improved	Pink	4.13	1.85	24.45	4.13	1.85	**24.45**
12 Jersey	White	6.55	1.58	23.13	6.55	1.58	**23.13**
13 French Yellow	Yellow	3.85	1.29	18.80	3.85	1.29	**18.80**

The *White Silesian* sugar beet, which was at the head of the list in 1893, occupies the same position in 1894. Not only does the White Silesian give the largest average yield of roots among the ten varieties grown for three years in succession, but it also gives the largest yield of roots among all the varieties tested in 1894. With one exception it also produced the largest yield of tops per acre among the thirteen varieties grown during the past season. Among the new varieties the *New Danish Improved* heads the list in yield of roots, producing 24.45 tons per acre. The *Jersey* variety, however, produced 6.5 tons of tops per acre thus making it the heaviest topped variety among those tested. The *Lane's Improved* produced the smallest yield of tops per acre being only about one-half the weight of those of the Jersey variety.

Silage and Fodder Crops.

The experiments under the heading of silage and fodder crops include those with fodder corn, various mixtures of grain for fodder, millet, rape, sunflowers, clovers, grasses, etc. Fodder crops are becoming more important in Ontario's agriculture year by year. A few years ago, there was but a very limited quantity of corn grown, and that was principally for the production of grain, and confined almost entirely to the Canada Yellow variety. Now a large number of varieties of fodder corn are grown over Ontario since, due in a large measure to the introduction of the silo. The fodder crops of various kinds can be used in several ways ; as nearly all of them can be used as green food for the summer and for ensilage or dry food for winter.

Fodder Corn, Comparative Test of 110 Varieties.

In 1894, 110 varieties of fodder corn were grown in the experimental department Of this number 55 were grown side by side for four years in succession, 8 for three years, 16 for two years, and 31 were grown in 1894 for the first time. The seed was mostly obtained from the United States, but some was obtained in Ontario. All the varieties were grown in duplicate; the duplicate plots being about 20 rods apart. The character of the soil, previous cropping, etc., were exactly the same for each sectation of the experiment. The land was rather high-lying, and was what might be termed an average clay loam. A crop of grain was grown on the land in 1893, and an application of 20 tons of farmyard manure was applied in the spring before the corn was planted. The land was plowed in the autumn after the grain crop was removed, and in the spring it was thoroughly cultivated and the manure well worked into the soil. The corn was planted on June 1st, with the exception of numbers 80, 88 and 105, which was planted on June 6th. The seed was put in hills five links (39.6 inches) apart both ways. Eight kernels were dropped in each hill, and after the corn was up nicely it was thinned out to four plants per hill.

It will be observed that among 55 varieties grown side by side for four years in succession, the *Chester County Mammoth* gives the largest total yield per acre, and the *Brazilian Flour* the second largest. These, however, are very late varieties, and are entirely unsuited for Ontario conditions, as the grain, when cut about the middle of September has not even reached the early milk stage in the average of four years' trials. The *Thoro'bred White Flint* stands third in the yield per acre. This is also a late variety and is unsuited to the greater part of the province. It, however, reaches a sufficient stage of maturity in the southern counties. In our experimental plots for four years the grain of this variety has averaged the milk condition when the crop was cut just before the autumn frosts. The *Cloud's Early Yellow* is the earliest to mature among the heavy yielding varieties for four years. It has given a average of a little over 20 tons per acre, and the corn has reached the late milk stage. The ears are, however, large and yield heavily per acre. This is certainly one that has made a good record among the varieties. The *Improved Leaming*, which has given an average of 19 tons per acre for four years, has produced grain which, on the average, reached the dough stage at the time of cutting. This variety can be grown to good advantage in the central to southern part of the province.

TEST OF 110 VARIETIES OF FODDER CORN.

Varieties.	Kind of corn.	Results for 1894. Condition of grain when harvested.	Results for 1894. Average yield of whole crop per acre.	Average results for number of years. Condition of grain when harvested.	Average results for number of years. Average weight per ear when harvested.	Average results for number of years. Yield of ears per acre.	Average results for number of years. Yield of whole crop per acre.
Grown for four years :			tons.		oz.	tons.	tons.
1 Chester Co. Mammoth	White Dent....	Early Milk	19.73	Water	3.32	1.19	21.28
2 Brazilian Flour.......... .	"	Water	18.10	"	1.42	.41	21.08
3 Thoro'bred White Flint....	"	Late Milk	18.23	Milk	4.57	1.79	20.63
4 Mammoth White Surprise..	"	Early Milk	14.18	Water	3.36	.85	20.50
5 Blunt's Prolific	"	Late Milk	18.40	Early Milk	3.20	1.23	20.22
6 Cloud's Early Yellow.......	Yellow Dent....	"	15.93	Late Milk	7.14	3.40	20.11
7 Mastodon Dent	"	"	16.95	Milk	6.59	2.95	20.03
8 Virginia Horsetooth	White Dent....	Milk	16.63	Water	2 52	.93	19.14
9 Mammoth Sweet Fodder ..	White Sweet ..	Dough	13.80	Milk	5.23	2.46	19.10
10 Improved Leaming	Yellow Dent....	Firm Dough	16.25	Dough	5.84	3.12	18.95
11 Giant Prolific S. Ensilage..	White Dent....	Dough	18.53	Milk	5.40	2.20	18.85
12 Golden Beauty	Yellow Dent....	"	16.55	"	4.94	2.38	18.70
13 Mammoth W. Cob Ensilage.	White Dent....	Late Milk	17.20	Early Milk	4.03	1 70	18.66
14 Hickory King	"	Milk	19.30	"	2.64	.98	18.55
15 Mammoth Southern Sweet..	White Swee .	Early Milk	17.55	"	3.98	1.59	18.53
16 Red Cob Ensilage..........	White Dent....	Late Milk	16.60	"	3.59	1.27	18.49
17 Centennial White	"	Dough	16.75	Late Milk	6.42	3.16	18.10
18 Mammoth Cuban..........	Yellow Dent ..	Firm Dough	15.40	Dough	6.85	3.58	17.97
19 Sheep's Tooth	White Dent....	Late Milk	20.18	Early Milk	5.58	1.55	17.97
20 Salzer's Sup. Fod. Ensilage.	"	"	20.40	"	4.73	1.79	17.85
21 Horsetooth	Yellow Dent ..	Ripe	13.28	Dough	5.85	3.04	17.51
22 Egyptian Sweet........	White Sweet ..	Dough	18.95	Milk	4.16	1.95	17.17
23 Salzer's North Dakota......	White Flint....	Ripe	15.70	Firm Dough	5.38	2.98	17.00
24 Evergreen Sweet	White Sweet ..	Dough	15.95	Milk	5.12	2.35	16.69
25 Hickox Sweet	"	"	15.18	"	5.58	2.63	16.64
26 Salzer's South Dakota.....	Yellow Flint ..	Ripe	15.85	Ripe	5.01	2.98	16.47
27 Tuscarora	White Flint....	Dough	15.00	Dough	6.19	3.02	16.28
28 Wisconsin Earliest W. Dent	White Dent....	Firm Dough	15 75	"	7.73	3.71	15.90
29 Sweet Fodder	White Sweet ..	"	15.40	Late Milk	4.57	1.34	15.87
30 Queen of the Prairie	Yellow Dent ..	Ripe	18.30	Ripe	5.17	3.53	15.86
31 Clark's Co. Champion	White Dent....	Firm Dough	13.88	Late Milk	5.95	2.72	15.64
32 Large White Flint	White Flint....	"	11.75	Ripe	5.26	3.15	15.46
33 Stowell's Evergreen Sweet..	White Sweet ..	"	14.00	Late Milk	4.69	2.11	15.22
34 Old Colony.................	"	"	14.45	"	4.89	2.64	15.09
35 Compton's Early	Yellow Flint ..	Ripe	12.95	Ripe	6.30	3.36	14.95
36 Longfellow................	"	"	13.65	"	5.28	2.93	14.83
37 Early Butler	Yellow Dent ..	"	14.30	Dough	6.80	3.10	14.83
38 Angel of Midnight.........	Yellow Flint ..	"	14.23	Ripe	5.25	2.85	14.67
39 Late Mammoth Sweet	Yellow Sweet ..	Dough	16.03	Milk	6.10	2.19	14.56
40 Pride of the North	Yellow Dent ..	Ripe	15.93	Ripe	5.43	2.96	14.54
41 Wauskakum	Yellow Flint ..	"	13.28	"	5.42	2.91	13.37
42 100-day Corn	"	"	15.50	"	5.29	2.96	13.36
43 Early White Flint.........	White Flint....	"	14.95	"	5.72	3.00	13.32
44 Golden Dent	Yellow Dent ..	"	13.70	"	5.54	2.83	13.16
45 Dakota Dent	"	"	12.53	"	6.02	3.15	13.11
46 Queen of the North........	" ...	"	14.93	"	5.54	2.98	13.00
47 Early Adams or Burlington	White Dent....	"	9.08	Dough	5.11	2.73	12.96
48 Canada Yellow	Yellow Flint ..	"	11.08	Ripe	5.74	2.95	12.82
49 Self Husking........	Reddish Flint ..	"	12.80	"	4.47	2 53	12.76
50 Minnesota King	Yellow Dent ..	"	13.65	"	5.91	3.09	12.44
51 King of the Earlies	"	"	12.38	"	6.10	2.88	11.78
52 Pearce's Prolific	Yellow Flint ..	"	10.70	"	4.78	2.18	11.62
53 Crosby	White Sweet ..	Firm Dough	10.05	Late Milk	4.49	2.60	11.36
54 Smutnose	Pinkish Flint ..	Ripe	10.25	Ripe	5.97	3.05	10.87
55 Rideout or Mercier	Yellow Flint ..	"	9.55	"	5.83	2.91	10.75
Grown for three years :							
56 Giant Beauty...............	Yellow Dent ..	Dough	16.68	Late Milk	7.61	3.31	20.86
57 Dr. Woodhull	"	"	18.70	"	6.62	3.00	20.57

List of 110 Varieties of Fodder Corn.—*Concluded.*

Varieties.	Kind of corn.	Results for 1894. Condition of grain when harvested.	Results for 1894. Average yield of whole crop per acre.	Average results for number of years. Condition of grain when harvested.	Average weight per ear when harvested.	Yield of ears per acre.	Yield of whole crop per acre.
Grown for three years (Con.)							
58 N. B. & G. Co's. Giant Fod.	White Dent ...	Late Milk	17.25	Milk	4.38	1.55	19.72
59 Pride of Kansas	Yellow Dent ..	"	12.75	"	5.32	1.96	18.54
60 New Leaming	"	Firm Dough	14.90	Dough	6.56	3.11	17.89
61 True Leaming	"	"	16.00	"	7.60	3.49	17.87
62 Wilson's White Prolific	White Dent....	Dough	12.63	Late Milk	6.63	2.95	16.56
63 Silver Flint	White Flint....	Ripe	10.88	Ripe	6.72	3.15	12.59
Grown for two years:							
64 Peach Blossom Mam. Field	Pinkish Dent ..	Dough	16.75	Milk	7.62	2.91	21.10
65 Champion White Pearl	White Dent....	"	16.50	Late Milk	6.79	3.39	20.03
66 Boone Co. White	"	"	19 15	Milk	5.83	2.45	19.60
67 Kansas King	"	Milk	18.30	Early Milk	4.29	1.74	19.30
68 Legal Tender	Yellow Dent ..	Dough	18.90	Late Milk	5.75	2.69	19 18
69 Giant White Southern	White Dent....	Late Milk	17.95	Milk	5.01	2.27	19.00
70 Big Buckeye	Yellow Dent ..	Dough	18.13	Late Milk	6.31	2.61	18.44
71 Elephant Fodder	"	Ripe	16.15	Dough	6.61	2.99	18.35
72 Mammoth S. for Ensilage	White Sweet ..	Dough	14.73	Late Milk	6.40	2.60	17.89
73 Queen of the Field	Yellow Dent ..	Firm Dough	16.18	Dough	7.88	3.86	17.12
74 Iowa Gold Mine	"	"	16.18	"	6.56	2.90	16.62
75 Red Blazed	Reddish Dent ..	Ripe	13.13	Ripe	6.85	3.58	16.42
76 N. B. & G. Co's. Hustler White Dent	White Dent....	Firm Dough	14.55	Dough	8.17	3.87	15.70
77 Dakota Queen	Yellow Dent ..	Ripe	12.45	Ripe	6.75	3.64	13.68
78 Extra Early Huron Dent	"	"	12.30	"	6.49	3.32	13.30
79 Farmer's Favorite	"	Dough	17.90	Milk	8.87	1.84	11.65
Grown for one year:							
80 White Souther	White Dent....	Milk	21.73	Milk	......	1.54	21.73
81 Nebraska White Prize	Yellow Dent ..	"	19.40	"	7.07	2.96	19.40
82 Red Blaze	Reddish Flint..	Ripe	19.13	Ripe	7.36	3.47	19.13
83 Perfect Mammoth Ensilage	White Dent....	Dough	18.70	Dough	6.22	2.99	18.70
84 Riley's Favorite	"	"	18.40	"	6.84	3.38	18.40
85 Paragon White Ensilage	"	"	17.80	"	6.58	2.90	17.80
86 High Mixed	Yellow Dent ..	Firm Dough	17.65	Firm Dough	8.09	3.74	17.65
87 White Prolific	White Dent....	"	17.35	"	6.87	3.22	17.35
88 Canadian Dent	Yellow Dent ..	Ripe	17.30	Ripe	......	3.26	17.30
89 Salzer's Early Giant W. Dent	White Dent....	Firm Dough	17.15	Firm Dough	9.42	4.36	17.15
90 Early White Cap Dent	"	"	16.85	"	7.86	3.59	16.85
91 Champaign Co. Prolific	Yellow Dent ..	Dough	16.73	Dough	6.06	2.35	16.73
92 King Philip	Reddish Flint ..	Ripe	16.53	Ripe	7.83	4.08	16.53
93 90-days Leaming	Yellow Dent ..	Firm Dough	16.53	Firm Dough	7.24	3.14	16.53
94 Waterloo Extra Early Dent.	" ..	"	16 50	"	6.29	2.75	16.50
95 Yellow West. Horse-tooth.	"	"	16.30	"	6.95	3.19	16.30
96 Golden Superb	"	"	16.30	"	7.68	3.07	16.30
97 Nebraska Mammoth Red	Red Dent	"	16.25	"	7.49	3.37	16.25
98 Early California	Yellow Dent ..	Dough	16.15	Dough	5.93	2.61	16.15
99 North Star Yellow Dent	"	Ripe	14.83	Ripe	8.00	3.68	14.83
100 Squaw	Variegated Flint	"	14.20	"	5.87	3.19	14.20
101 Sanford Corn	White Flint....	Firm Dough	14.05	Firm Dough	5.57	2.75	14.05
102 Hutt	Yellow Dent ..	Ripe	14.05	Ripe	7.68	3.82	14.05
103 Wisconsin White Flint	White Flint....	Firm Dough	13.50	Firm Dough	5.43	2.51	13.50
104 Pride of Canada	Yellow Flint ..	Ripe	12.83	Ripe	4.94	2.75	12.83
105 Smoky Dent	Reddish Dent ..	"	12.18	"	.....	4.50	12.18
106 Gold Medal Dent	Yellow Dent ..	"	12.05	"	7.95	3.98	12.05
107 Red Glazed	White Flint....	"	11.00	"	6.38	2.95	11.00
108 Dakota Gold Coin	Yellow Dent ..	"	10.60	"	5.34	2.74	10.60
109 Rawling's	"	"	10.18	"	7.36	3.36	10.18
110 Excelsior Yellow Dent	Yellow Flint ..	"	6.65	"	5.19	2.04	6.65

The *Mammoth Cuban* has given an average of 18 tons per acre for four years, and has given grain which reached the dough condition at this place. It produces a large ear and a heavy weight of grain per acre. The *Salzer's North Dakota* is the heaviest yielding variety among the 55 varieties grown for four years which produced grain that reached the firm dough stage at the time of harvest. This variety is a safe one to grow in the vicinity of Guelph, and even considerably farther north, for ensilage purposes. It ripens nearly as early as the Compton's Early variety, and produces an average of about two tons per acre more than that variety. The *Wisconsin Earliest White Dent* is a variety which has also given good satisfaction. Its most prominent characteristic is the large well-developed ears which are produced. It is one of the heaviest eared varieties among the 110 kinds tested. The *Compton's Early* is fairly well known over the province, and will mature in nearly every locality. It produces a fair amount of grain; but in nearly all cases larger varieties will reach a sufficient stage of maturity for either production of grain or for use in the silo. The heaviest yield per acre in 1894 was produced by the *White Souther*, which gave an average of 21.73 tons per acre. This variety produced grain which was only in the milk stage at the time of cutting the corn. The table given above is worthy of very close study by every corn grower in Ontario, as all the leading varieties have been grown side by side under similar conditions for one, two, three, or four years.

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

For three years in succession an experiment has been conducted with fodder corn, with the object of determining the proper distance between the rows and between the plants in the rows, to give the most satisfactory results. For this experiment an early, a medium and a late variety were selected. Each variety was grown in drills 30, 36 and 42 inches apart, and the corn in each set of the drills planted 4, 8 and 12 inches apart. 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 3 inches high. This experiment throughout was conducted in duplicate. The soil on which the corn was grown was a mild clay loam, which had grown a crop in 1893, and received a dressing of twenty tons per acre of fairly well-rotted farmyard manure in the spring of 1894. The land was plowed in the autumn after the grain was removed; but in the spring the manure was well mixed through the soil by thorough cultivation without the use of the plow. Planting took place on June 6th and 7th. The following table gives the average results from three years in which this experiment has been conducted.

In examining the average results of three years in the above table, we notice that in every instance the largest total yield per acre is produced from thinning to 4 inches in the drill, the second from thinning to 8 inches, and the lowest from thinning to 12 inches. This applies to the early, medium and late varieties of corn, and to the rows which were 30, 36 and 42 inches apart with each variety. In regard to the average weight per ear, the opposite is the case, as the largest ears, in every instance, were produced by thinning to 12 inches in the drill, the second largest by thinning to 8 inches in the drill, and the smallest were produced where the plants were left to 4 inches apart in the drill. This also holds good with the three varieties, and for the different distances apart of each variety.

The largest yield of ears per acre was produced by planting the Mammoth Southern Sweet in drills 42 inches apart and thinning to 8 inches apart in the rows; by planting the Wisconsin Earliest White Dent in drills 36 inches apart and thinning to 8 inches apart in the drill, and by planting the Compton's Early 30 inches apart and thinning to 8 inches apart in the drill. It will be noticed that the thickest seeding of the Compton's Early gave a heavier total yield per acre than the thinnest seeding of the Mammoth Southern Sweet and at the same time produced nearly double the amount of grain per acre. The results in the above table should be of very great value to every person in

Ontario who is growing corn extensively, as it gives some very important information in regard to the best distance to plant early, medium and late varieties of corn for the production of both stalks and ears.

Distance between drills.	Distance between plants in the drill.	Average weight per ear.		Yield of ears per acre.		Yield of whole crop per acre.	
		1894.	Average three years, 1892-3-4.	1894.	Average three years, 1892-3-4.	1894.	Average three years, 1892-3-4.
		oz.	oz.	tons.	tons.	tons.	tons.
Mammoth Southern Sweet:							
30 inches	4 inches.	2.48	2.75	2.19	1.61	23.46	23.18
	8 "	2.46	2.99	1.94	1.59	18.86	19.61
	12 "	3.59	3.72	2.13	1.77	16.48	17 24
36 inches	4 "	2.95	2.86	2.63	1.41	22.81	19.96
	8 "	4.10	3.87	2.20	1.80	17.20	18.01
	12 "	6.11	5.07	2.32	1.87	15.30	15.99
42 inches	4 "	....	....	3.79	1.90	24.89	20.13
	8 "	....	....	3.26	2.06	16.60	17.47
	12 "	....	....	2.86	1.97	16.72	16.30
Wisconsin Earliest White Dent:							
30 inches	4 "	3.21	3.61	3.07	3.53	17.72	19.09
	8 "	4.96	5.52	3.32	3.61	13.86	15.58
	12 "	8.34	8.07	3.22	3.72	12.47	14.43
36 inches	4 "	4.20	3.93	3.49	3.08	16.21	16.28
	8 "	6.85	7.25	3.71	3.78	13.98	15.37
	12 "	7.17	8.24	3.05	3.38	11.59	13.38
42 inches	4 "	5.01	4.58	4.35	3.69	17.82	16.96
	8 "	7.84	7.33	3.65	3.62	13.54	14.93
	12 "	9.04	9.15	3.60	3.49	13.12	13.33
Compton's Early:							
30 inches	4 "	3.26	3.55	2.94	3.41	18.41	18.42
	8 "	5.09	5.21	3.71	3.68	16.14	15.78
	12 "	6.52	6.52	3.08	3.33	14.06	14.41
36 inches	4 "	2.98	3.49	2.44	2.97	13.28	14.87
	8 "	5.60	5.91	3.58	3.61	13.16	14.22
	12 "	6.39	6.92	2.80	3.08	10.02	12.44
42 inches	4 "	3.96	3.87	3.31	3.16	13.82	13.71
	8 "	6.50	6.33	3.17	3.28	12.27	12.94
	12 "	7.78	7.17	2.86	3.01	11.14	12.45
Average of the three varieties:							
30 inches	4 "	2.98	3.30	2.73	2.85	19.86	20.23
	8 "	4.17	4.57	2.99	2.96	16.29	16.99
	12 "	6.15	6.10	2.81	2.94	14.34	15.36
36 inches	4 "	3.38	3.43	2.85	2.49	17.43	17.04
	8 "	5.52	5.68	3.16	3.06	14.78	15.87
	12 "	6.56	6.74	2.72	2.78	12.30	13.94
42 inches	4 "	4.49	4.23	3.82	2.92	18.84	16.93
	8 "	7.17	6.83	3.36	2.99	14.80	15.11
	12 "	8.41	8.16	3.11	2.82	13.66	14.03

Fodder Corn, Seed Selected from Different Parts of the Ear.

In 1894 an experiment was conducted by planting corn from the small end, middle, large end, and also from the whole ear. The corn from which the seed was selected was grown in the experimental department in 1893. Four varieties of corn were used for this experiment. This experiment would not be exactly the same as if the whole field were sown with seed from the small end or from the other parts of the ear, as the different plots were situated side by side and should there be any lack of fertilization from any of the class of kernels sown, the plants could become fertilized from the adjoining plots. This experiment, when repeated a number of times, should go to show whether or not it is advisable to plant the seed from the small end of the ear or to throw that away as is sometimes done. Planting took place on June 6th. The corn was planted in hills 39.6 inches apart both ways and four plants were allowed to grow in each hill. The corn was all cut on the same day and weighed immediately on being cut. The weight per ear was determined after the corn was husked and before it was thoroughly dry. The following table gives the results:

Selections.	Yield of cobs per acre.	Yield of whole crop per acre.
	tons.	tons.
Middle of cob	3.72	13.60
Small end of cob	3.28	12.45
Whole cob	3.21	12.40
Large end of cob	3.33	12.38

The above table gives the average results of the four varieties used for this experiment. In 1894 we notice that the largest yield per acre of whole crop was produced by the grain from the middle part of the ear. All the seed from the small end of the ear, from the average of the whole ear and from the large end of the ear produced practically the same, which was about $1\frac{1}{5}$ tons per acre less than the quantity produced from the grain in the middle of the ear. The yield of ears was also the highest from the grain which was taken from the middle of the cob. This experiment will likely be repeated in the future.

Fodder Corn, Planting Large and Small Grain of the Same Variety.

For this experiment two varieties of corn were selected and the test was carried on in duplicate with each variety. The corn which was used was supposed to be choice samples received from seedsmen. From these samples large uniform grains were selected for one part of the experiment and small irregular grains for the other part. This corn was planted on June 7th in hills 39.6 inches apart both ways. Four plants were allowed to remain in each hill. The corn was all cut on the same day. It will be understood that the seed was perfectly sound in both cases and the comparison was simply a matter of size and uniformity of grains. The following table gives the average results for the two varieties of corn used in this experiment and for the duplicate of each variety:

——	Yield of whole crop per acre.	Yield of cobs per acre.
	tons.	tons.
Large seed	16.40	2.74
Small "	15.40	2.33

We notice by the above table that the good seed produced exactly one ton per acre more corn than the small seed. The yield of green ears per acre was $\frac{2}{5}$ of a ton per acre more from the large uniform seed than from the smaller and more irregular seed.

Fodder Corn, American and Canadian Seed.

For this experiment four varieties of corn were selected. The seed of the varieties obtained from the United States was planted by the side of the same varieties which had been grown in Ontario. The Ontario seed of one of the varieties was grown in the Niagara peninsula, the seed of another in Lambton county, and the seed of the remaining other two varieties at the Agricultural College. The seed corn of these same varieties were obtained from the Eastern and Middle States. The corn was all planted on June 6th in hills 39.6 inches apart both ways. Eight kernels were planted in each hill and after the plants were about four inches high they were thinned to four plants per hill. The corn was all cut on the same day. The following table gives the results :

Country obtained from.	Yield of whole crop per acre.	Yield of cobs per acre.
	tons.	tons.
Ontario	15.83	4.12
United States	15.64	3.93

It will be observed from the above table that the yield from the seed grown in Ontario and that grown in the United States was not widely different. The yield of the whole crop per acre and also of the ears per acre were slightly in favor of the seed grown in Ontario.

Millet, Comparative Test of 16 Varieties.

Among the 16 varieties of millets which were grown on the experimental plots in 1894, 8 were grown for three years, 2 for two years, and 6 were new varieties grown for the first time during the past season. The land upon which the millets were grown was an average clay loam which received a dressing of 20 tons of farmyard manure per acre in the spring of 1894. The seed was sown on June 8th at the rate of 40 lb. per acre. The crop was not cut until nearly ripe, and it was then shocked up and allowed to remain until partially dried before hauling to the barn. When hauled in the crop was weighed and was then run through the threshing machine. The seed was then cleaned. The yields for 1894 give the amount of seed per acre in bushels and the amount of partially dried whole crop in tons. The whole crop per acre is, on account of its being partially dried, somewhat less than in former years, but the comparison of the different varieties as shown in the following table is valuable :

The *Salzer's Dakota*, which heads the list in yield per acre among 8 varieties grown for three years in succession, did not yield quite as heavily in 1894 as three of the other varieties. The *Pearl Millet* gave the highest yield per acre of those grown during the past season ; but as this is a very late variety and one which did not produce any seed, on account of its leaves, the crop was much more succulent than in the case of the other varieties. The largest amount of seed in 1894 was produced by the California millet and the next largest by the Japanese variety. These produced a little over 41 bushels per acre. They were handsome millets when growing in the plots and the plants were well loaded with seed. The seed from the Hog millet and Russian millet weighed 59.25 lb. per measured bushel. In the co-operative tests over Ontario where three varieties were grown in 1892, three in 1893 and four in 1894, the Salzer's Dakota gave the highest average yield of whole crop per acre in each of the years mentioned.

Varieties.	Weight of millet seed per measured bushel.	Yield of millet seed per acre.	Yield of green crop per acre. 1894.	Average for number of years grown on plots.
Grown for three years:	lb.	bush.	tons.	tons.
1 Salzer's Dakota	48.56	11.47	4.32	6.84
2 German or Golden	....	1.27	5.28	6.69
3 Golden Wonder	....	1.37	5.36	6.26
4 Pearl	....	....	6.96	5.32
5 Common	55.00	28.13	3.20	4.67
6 White French	55.31	15.63	2.56	4.37
7 Red French	59.06	25.43	2.48	3.80
8 Broom Corn	57.38	15.63	2.32	2.31
Grown for two years:				
9 Western Grown	48.88	6.67	4.40	7.59
10 Hungarian Grass	51.38	17.93	2.72	5.06
Grown for one year:				
11 Magic	50.25	13.43	4.40	4.40
12 California	56.63	41.87	3.12	3.12
13 Canadian	56.75	34.37	3.08	3.08
14 Japanese	58.38	41.03	2.84	2.84
15 Hog	59.25	26.47	2.60	2.60
16 Russian	59.25	21.27	2.40	2.40

Mixed Grains Grown for Fodder Purposes.

For three years an experiment has been carried on in which grains have been grown separately, and in various combinations for fodder purposes. Peas, oats, barley and spring wheat were grown separately and combined, by making all the combinations possible with two of the classes of grains, three of the classes of grains, and all four classes of grains together. The experiment was carried on in duplicate. The soil was a clay loam, which had received a dressing of 20 tons per acre of farmyard manure in the spring of 1894. Seeding took place on May 11th. When grown singly the same quantity of seed was used per acre as in the variety tests; when the grains were grown in mixtures, two-thirds the quantity used in the variety tests was sown in every instance.

The following table gives the average results of the grain grown singly and grown in the various combinations as indicated in the table :

Crops.	Yield of green crops from grains sown separately, 1894.	Average yield of green crop from mixed grains. 1892.	1893.	1894.	Average three years, 1892-3-4.
	tons.	tons.	tons.	tons.	tons.
1 Peas and oats	8.02	10.95	6.01	8.14	8.37
2 Barley, peas and oats	7.19	9.95	5.30	7.25	7.50
3 Barley and peas	6.77	8.50	5.93	7.25	7.23
4 Peas, wheat and oats	6.73	8.20	6.94	6.46	7.20
5 Barley and oats	6.79	7.08	6.12	7.29	6.83
6 Barley, peas, wheat and oats	6.43	9.85	4.01	6.43	6.76
7 Barley, wheat and oats	5.91	8.60	4.77	6.36	6.58
8 Wheat and oats	6.10	7.58	5.28	6.64	6.50
9 Peas and wheat	6.08	7.95	4.48	5.89	6.11
10 Barley, peas and wheat	5.90	7.45	3.98	6.21	5.88
11 Wheat and barley	4.85	6.15	4.81	5.20	5.39

It will be observed that the largest yield per acre in 1894 was produced from the *mixture of peas and oats.* This mixture also gave the largest yield per acre in the average of the experiments of three years. In the results of the past year, larger yields of green crop were produced from the mixtures than from the same grains when sown separately in 8 out of the 11 separate tests. The results point towards the advantage of sowing a mixture of peas and oats together. Not only does this mixture give the largest average yield per acre of the various combinations used, but it also produces a food which is of excellent quality whether fed in the green state or converted into dry fodder.

Mixed Grains, Peas and Oats Sown in Different Quantities for Fodder Purposes.

In this experiment nine plots were sown with oats and peas in varying proportions. and the experiment was conducted in duplicate, making in all eighteen plots. The land had received similar treatment to that described under the heading of "Mixed grains grown for fodder purposes." The seed was sown on May 12th.

Mixtures of grain.	Yield of green crop per acre.			
	1892.	1893.	1894.	Average 1892-3-4.
	tons.	tons.	tons.	tons.
1 Oats 1 bushel and peas 3 bushels per acre	11.35	6.32	7.75	8.47
2 " 2 " 3 "	11.75	6.52	7.00	8.42
3 " 2 " 1 "	11.55	6.28	6.89	8.24
4 " 1½ " 2 "	11.85	5.88	6.54	8.09
5 " 1½ " 1 "	12.10	4.88	7.21	8.06
6 " 1 " 1 "	11.80	4.68	7.61	8.03
7 " 1½ " 3 "	11.40	5.72	6.46	7.86
8 " 1 " 2 "	10.75	4.18	7.79	7.57
9 " 2 " 2 "	10.10	5.36	7.07	7.51

As this experiment has been conducted for three years in succession, we find that in the average of three years' trials *one bushel of oats and three bushels of peas* gave the largest yield per acre, but there is not a very wide variation in the yield per acre of the first six mixtures mentioned in the above table. When three bushels of peas are sown with one or with two bushels of oats, the crop is apt to lodge badly. All things considered we believe the best mixtures for land similar to that upon which this experiment has been conducted are *one bushel and a half of oats and one bushel of peas*, or two bushels of oats and one of peas. With each of these combinations the crop usually stands up well and a fine quality of food is produced.

Sunflower, Comparative Test of 7 Varieties.

In 1894, seven varieties of sunflower seed were obtained from different seedsmen, the most of whom were located in the United States. The seed was planted in rows 25 inches apart on June 9th. The land was cultivated similarly to that on which the corn was planted. The different varieties were all cut on the same day.

Varieties.	Average height.	Yield of heads per acre.	Total yield per acre.
	inches.	tons.	tons.
1 Texas Silver Queen..............................	70	5.20	12.80
2 Helianthus Globosus..............................	65	6.72	8.68
3 Black Giant	52	4.88	6.40
4 Mammoth Russian Giant..............................	58	4.40	6.32
5 Common	62	4.80	5.04
6 Dwarf, double flowered	31	5.64	4.60
7 Double California	54	2.40	4.00

The Texas Silver Queen, which was grown on the plots this season for the first time, gave the largest total yield per acre, but the largest weight of heads, from the different varieties, was obtained by one called the *Helianthus Globosus* obtained from the United States. No common name was mentioned for this variety.

Rape, Selection of Seed.

A duplicate experiment was carried on in 1894 in which large, medium, and small sized seeds of the Dwarf Essex Rape were sown. These seeds were all selected from one package, which had been obtained for general sowing. The seed was not a bad looking sample, but when sifted and the seeds put into three different classes a very marked difference was observed between the best, the medium, and the poorest quality. Nothing but sound seeds, however, were sown in any instance. Seeding took place on July 6th. The following table gives the average results of the experiment :

Selection.	Yield of rape per acre.
	tons.
Large	33.98
Medium	22.80
Small	11.78

The results from this experiment are certainly very interesting and show a very wide difference in the produce from the different classes of seed. The large seed produced about three times as much per acre as the small seeds ; and the medium sized seeds about twice as much as the small seed. This experiment will likely be repeated in future years. On examining the results of this experiment it might also be well to refer to the variation from the different qualities of seed in the experiments with roots, grain and corn which have been already mentioned.

Rape, Methods of Cultivation.

Rape was sown in three different ways in the spring of 1893. In one instance the and was ridged with a double mould-board plow in rows 26.4 inches apart ; in another instance the rows were the same distance apart but the land was left unridged, and in the third instance the seed was sown broadcast and harrowed in. Equal amounts of seed were used in every instance. The seeding took place on June 30.

Methods of cultivation.	Yield of whole crop per acre.
	tons.
Flat cultivation	7.71
Ridged "	7.48
Broadcast	7.06

The experiment conducted in 1894 shows that the best results were obtained from seeding in rows 26.4 inches apart, and which were left flat, and the poorest results were obtained from sowing the seed broadcast. There was only about $\frac{2}{3}$ of a ton per acre, however, between the best and the poorest yielding plots.

SUGAR CANE, BROOM CORN, KAFFIR CORN, ETC.

During the past year, a number of varieties of sugar cane, millo maize, Kaffir corn etc., were grown upon the trial plots. These were all sown in rows 25 inches apart upon land which had received a dressing of 20 tons per acre of farmyard manure in the spring of 1894. The seeding took place on June 9th. The following table gives the average height, yield of heads per acre, and the whole crop per acre of the different varieties:

Variety	Kind of fodder crop.	Average height.	Yield of heads per acre.	Yield of whole crop per acre.
		inches.	tons	tons.
Early Orange	Sugar Cane	73	....	22 0
Fodder	" "	86	.04	20.3
Early Amber	" "	87	.32	20.2
White African	" "	65	....	17.5
Millo Maize	Millo Maize	75½	....	16.2
California Golden	Broom corn	90	1.60	11.7
Dwarf Broom	" "	76	1.68	9.3
Yellow Millo Maize	Millo Maize	53	1.04	8.6
Improved Evergreen	Broom corn	82	2.28	7.8
Kaffir corn	Kaffir corn	54	....	7.8
Jerusalem corn	Jerusalem corn	56	1.27	5.3

It will be observed in the above table that the *Early Orange sugar cane* gave the largest yield, producing 22 tons per acre. This was followed closely by the fodder cane and the Early Amber sugar cane, all of which gave upwards of 20 tons of green fodder per acre. The Kaffir corn and the Jerusalem corn came at the bottom of the list in amount of crop produced. These latter two varieties have been grown for a number of years, and are found to be too late in reaching maturity for this climate. We have received but poor results from the Kaffir and the Jerusalem corns during all our experience with these varieties.

CLOVERS, COMPARATIVE TEST OF 16 VARIETIES.

We have but little to report in regard to the clovers for 1894. Our clover plots in previous years were in the central part of the field which has now been transferred from the experimental to the farm department. In the spring of 1894 we, however, sowed a number of plots with clover in our experimental field in a location where they may remain for some length of time.

The seeding took place on May 12th. Some of the varieties gave a good growth during the summer, while others germinated very poorly; but we hope in another year to have all the varieties well established.

GRASSES, COMPARATIVE TEST OF 31 VARIETIES.

The remarks which were made in regard to the clover will apply equally well to the grasses, as the grass plots were situated in the central part of the field which is now used by the farm department. 31 varieties, however, of the leading grasses from ten years experience in our plots, along with a few of the native grasses from the Northwest, and also some promising varieties from Australia, were sown in plots in the experimental department on May 15th, 1894. We hope to leave these plots undisturbed for a number of years, that the various varieties may be carefully studied in regard to their value for agricultural purposes. Some of the varieties grew well during the past season, while others were failures. We hope, however, in the near future to have all the leading varieties of grasses well established in our experimental plots.

Co-operative Experiments.

About 100 plots were grown in the experimental department in 1894 in conjunction with 7,721 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 :

No. of experiments.	Name of experiments.	No. of plots required for each.
I.	Testing nitrate of soda, superphosphate, muriate of potash, mixture and no manure with oats	5
II.	Comparing the advantage of nitrate of soda alone and nitrate of soda with superphosphate over no fertilizer with rape	3
III.	Ascertaining the relative value of four varieties of Millet	4
IV.	Growing Lucerne as a crop for fodder	1
V.	Testing six leading varieties of Fodder Corn	6
VI.	Testing five leading varieties of Turnips	5
VII.	Testing five leading varieties of Mangels	5
VIII.	Testing five leading varieties of Carrots	5
IX.	Testing five leading varieties of Spring Wheat	5
X.	Testing five leading varieties of Barley	5
XI.	Testing six leading varieties of Oats	6
XII.	Testing four leading varieties of Peas	4
XIII.	Testing six leading varieties of Potatoes	6
XIV.	Testing five leading varieties of Winter Wheat	5

Experimental Building.

During the year 1894, upwards of 1,700 plots were devoted to the experimental work at the Agricultural College, and 7,721 packages of grains, seeds and fertilizers were distributed among the farmers of Ontario. It is almost impossible to do this work in the most satisfactory manner with the present accommodation ; our grains and potatoes are now stored in a number of the buildings on the College grounds. We were unable to keep samples of our different varieties of roots, to determine the keeping qualities of the same, owing to lack of accommodation. We are compelled to use nearly the whole of the basement of the chemical laboratory for the work rooms and an upper compartment for an office. This is 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 almost no opportunity of examining the various products which have been grown upon the experimental plots during the past season.

An experimental building is greatly needed in which work could 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 examination and for testing in different ways ; where the reports could be prepared with the products near to hand for reference ; where an exhibition of all the varieties of grain, both in straw and sample jars, could be neatly arranged for the benefit of farmers and others visiting the college ; where a small conservatory could be built for testing the germination of seeds, etc. ; and where a general office, a private office, a dark photographic room, and a storage room for fertilizers, etc., could be provided.

Respectfully submitted,

C. A. ZAVITZ,
Experimentalist.

Ontario Agricultural College,
Guelph, Dec. 31st, 1894.

VIEW OF THE EXPERIMENTAL GROUNDS, FROM NEAR THE COLLEGE BUILDINGS.

VIEW OF DAIRY DEPARTMENT, TAKEN FROM THE COLLEGE.

PART IX.

REPORT OF THE

PROFESSOR OF DAIRYING.

To the President of the Ontario Agricultural College ;

SIR,—I beg leave to present the report from the Dairy Department for 1894. In doing so, I feel that I am under obligation to yourself for counsel and help at various times. The instructors of the Dairy School did good work during the year, and we are particularly indebted to Mr. A. T. Bell, our cheese instructor, for coming to our assistance in the cheese experiments. He left his work at home, and rendered us good service at no small inconvenience to himself. Messrs. Alex. MacLaren, R. M. Ballantyne, J. S. Pearce and D. Derbyshire gave us good lessons on scoring cheese and butter during the dairy school. We are indebted to these gentlemen. My assistants in the dairy and dairy stable have been faithful, and altogether the year has been one of good results.

You will find my report under the following heads :

I. DAIRY SCHOOL.

II. EXPERIMENTAL WORK : CHEESE, CREAMING, MILK TESTING, FEEDING.

III. DAIRY STOCK.

IV. TRAVELLING DAIRY.

V. MISCELLANEOUS.

I. DAIRY SCHOOL.

The Dairy School opened on January 15th and closed March 16th, making a full two months' course. The attendance was not so large as we expected at first, owing to the fact that many were unable to come, after having made application. No doubt this will always be a hindrance, and a difficulty to overcome in accepting applications. Some apply and make no special effort to attend, while others apply and find there is lack of room. I hope that your efforts to solve this difficulty during the term of 1895 may be successful.

While the school was a success this year, yet we were greatly hampered owing to the fact that the new building was not completed when the students arrived. Then, after a couple of weeks, we found that the boiler in the dairy was not large enough to furnish steam for the new engine and heat both buildings. This necessitated the putting in of a larger boiler during the term, and in the middle of winter, so that our building and appliances were not completed until the term was far spent. However, our students were patient during all these drawbacks, and we were enabled to do fairly good work. It will be better in 1895.

As the boiler and engine are located in the home dairy building, we were obliged to carry steam pipes to the new dairy under the ground This was somewhat expensive, and there is also some loss from the steam being carried so far. The power from the engine is transmitted by means of a rope drive over pulleys, by way of the cheese department. Owing to the distance and the number of pulleys it caused some trouble during the term.

There were more instructors required this year, and two new ones were secured in the place of Messrs. Palmer and Linfield, who had left the College to enter new fields of labor. Messrs. Bell and Millar were retained in the cheese department, Mr. Sprague, the creamery instructor, was put in charge of the butter department, with Messrs. Beckett and MacTavish assistants, and Mr. Zufelt, a dairy student of 1893, and who stood at the head of the class, was given control of the milk testing. On the instructors, to a large extent, depends the welfare and success of the school, and I am personally indebted to them for their hearty co-operation to make the students feel that their time was being well and profitably spent.

The plan of lectures and practical work was similar to that of last year. Lectures were given each morning from 8.30 to 9.30, after roll-call, when the students were distributed to the four departments (cheese-making, separating, butter-making and milk-testing) for practical work under the instructors. Students were changed from one department to the other each day. For instance, if a certain division started at the cheese department, the next day they would be working with the separator, next day making butter, next, testing milk, and next cheese again. This gave variety to their work ; but some who had little or no experience found that they were not long enough in any one department to become familiar with the different steps of the process, so that this year we shall try a three day rotation, *i.e.*, instead of changing every day, students will go from one department to the other every third day.

The afternoon discussions were conducted in the cheese room, and they were found to be very popular and profitable. These last for one hour—usually from 2.30 to 3.30. Our new live-stock class-room enables us to illustrate the lectures on the dairy cow and the dairy breeds by living specimens brought into the lecture room. These were given during the afternoon, after most of the work had been completed. At present we have no Guernseys, but the other three leading dairy breeds are found in our stable.

Our students were for the most part cheese-makers, a few butter-makers, and some farmers. The ladies, of whom there were six in attendance most of the term, with a few occasional lady students who stopped but for a short time, were all farmers' daughters. Two of them took the home-dairy course, and the other four the factory course. We were pleased with their behavior and general conduct, and also to see that the men gave them the respect due to them. No lady need be alarmed about going to the Dairy School, "among so many men," as they will assuredly be treated with respect and courtesy. It is to be hoped that more of our young ladies will avail themselves of this opportunity of making an enlarged acquaintance, and of acquiring useful knowledge. If you, sir, and the Honorable Minister of Agriculture, could see the way clear to establish a school of domestic economy, including cooking, laundry, general housekeeping, poultry and dairying, I am satisfied that it would draw many ladies to the College, and be of great benefit to our farmers and the country generally.

The dairy library as yet is not large, chiefly for the reason that there are few books up to date on dairying. There are, however, quite a number being issued at present, and these we hope to have for the benefit of our students. All the leading agricultural journals and dairy papers are kept on file in the dairy during the term. It is hoped that by these means we shall cultivate a desire for good literature that bears more or less directly on the life-work of dairymen.

Thirty-nine students wrote on the final examination, and received certificates. As announced in our circular, special certificates will be awarded to those who pass the examinations during the course, and who comply with certain other conditions named therein. Six are entitled to receive these certificates in cheese-making, having completed the reports for the year, viz. : A. D. Perry, Harrowsmith, Frontenac Co. ; R. W. Stratton, Griffins' Corners, Elgin Co. ; C. H. Brayley, Marston, Norfolk Co. ; G. B. Brodie, Brantford, Brant Co. ; R. R. Milne, Newton, Perth Co. ; A. G. Calder, Clarksburg, Grey Co. All these were visited by me during the latter part of September and the beginning of October. I found their factories for the most part clean and tidy. One or two might have been improved slightly in this respect. All had good cheese in their curing rooms. Some of the factories were very poor, and the appliances were not up to date. Owners might make an improvement in these respects, and it would be an encouragement to the makers.

In two of the factories dividends were made according to the percentage of fat as determined by the Babcock test. Composite tests were made for a week, two weeks, and a month. Some of the factories have no tester. I would strongly urge the management of every factory to have a tester and use it occasionally, at least, though payment by test is not adopted. It will be found to exert a wholesome influence on the patrons and will show wide variations in the quality of milk sent by them.

Dairy Students' Reports.

For the monthly reports of dairy students, blank forms as follows were sent to each ; from these we learn a few interesting facts about the cheese industry from the point of view of the cheese-makers :

ONTARIO AGRICULTURAL COLLEGE.

Dairy School.

Cheese Work.

Report by............................for the month of ....18 .....
Name of factory in which you work..
P. O......................County....................Province ....
What position do you hold ? Head maker or helper....................................
Is factory joint stock or private ? .... Number of patrons ....
Number of cows.................... Pounds of milk received daily ....
Distance from factory to farthest patrons..
Do patrons aerate and properly care for the milk at home ?..........................
What is the condition of milk when received ? ....
Are dividends made according to the per cent. of fat in the milk ? ....
What test is used ?.......... .. How often is each patron's milk tested ?................
What is the highest per cent. of fat found in any patron's milk during this month ?............
What is the lowest per cent. of fat found in any patron's milk during this month ? ....
Average per cent of fat in mixed milk from all patrons ?................................
Is any butter made in the factory ? ....
How long is cheese held before shipping ? .. ..
How much milk is required for one pound of cured cheese ? ....
State highest and lowest temperature in curing room.......... ....
State highest, lowest and average price for month.................................... .
What per cent. of fat do you find in whey ?............................... ......
Is whey scalded at the factory ? ....
How much is charged per pound for making ?........ ....
Remarks :

In two of the factories where payment to patrons according to test was adopted we are able to see the variation in patrons' milk from month to month :

Month.	Mr. Brodie's factory.			Mr. Calder's factory.		
	Highest per cent. fat in any patron's milk.	Lowest per cent. fat.	Average per cent. fat in vats.	Highest per cent. fat.	Lowest per cent. fat.	Average per cent. fat for month.
May	4.2	3.0	3.7	....	....	....
June	4.4	3.1	3.6	....	....	....
July	4.4	3.2	3.6	4.1	3.1	3.52
August	5.6	3.1	3.8	4.0	3.1	3.63
September	4.7	3.0	4.1	4.2	3.0	3.63
October	4.8	3.1	4.1	5.0	3.1	3.90

The average pounds of milk received daily and also pounds of milk required to make a pound of cheese during the season, at the six factories is seen in the table :

Month.	Mr. Brodie's.		Mr. Calder's.		Mr. Stratton's.		Mr. Brayley's.		Mr. Perry's.		Mr. Milne's.	
	Av. lb. daily.	Milk for 1 lb. cheese.	Av. lb. daily.	Milk for 1 lb. cheese.	Av. lb. daily.	Milk for 1 lb. cheese.	Av. lb. daily.	Milk for 1 lb. cheese.	Av. lb. daily.	Milk for 1 lb. cheese.	Av. lb. daily.	Milk for 1 lb. cheese.
		lb.		lb.		lb.		lb.		lb.		lb.
May	10,000	10.38	....	......	3,582	10 82	1,467	10.63	9,000	10.25	4,050	10.30
June	11,400	11.00	8,000	10.67	6,467	11.06	2,038	10.88	14,000	10.35	9,144	10.60
July	9,000	11.45	7,600	10.58	6,126	11.53	1,974	11.47	13,000	10.80	10,246	10.90
August	7,000	11.06	6,000	10.13	4,950	11.07	1,804	11.05	10,000	10.42	8,900	11.50
Sept	5,700	10.57	5,000	9.40	3,950	10.46	1,402	10.55	9,000	9.80	8,500	
October	5,000	9.87	4,000	9.40	3,788	9.56	1,470	9.54	5,500	9.00	6,200	
Av. for season.	8,016	10.72	6,120	10.04	4,811	10.75	1,693	10.69	10,083	10.10	7,840	

Three of the factories are joint stock and three are managed by private individuals. The number of cows, the milk of which was sent to each factory varied from 100 to 600 ; and the number was greatest at each factory during June and July. These are the months when most milk was received. Patrons should endeavor to supply a more regular amount throughout the year, as it would be better for them and for the makers. The distance travelled for milk ranged from four to nine miles from the factories. Some reported that patrons took good care of the milk and some that they did not. There is evidently room for improvement in the quality of milk supplied to makers. Early in the season the cheese was shipped in ten days' or two weeks' time, but later the cheese were held for a month or more. One factory reports shipping fall cheese at the end of two weeks. The cost for hauling the milk and making the cheese varied from $1\frac{3}{4}$c. to $2\frac{1}{2}$c. per pound of cheese. The number of patrons varied from 22 to 100. The average price per pound of cheese obtained at the five factories was for May 9.29c., June 8.89c., July 9.19c., August 10c., September. 10.14c., October 10.11c.

It was with pleasure that I noticed a number of dairy students taking prizes for butter and cheese at the leading fairs. The Guelph Exhibition Society offered special prizes to the students of the Dairy School. At this exhibition most of the prizes in butter were carried off by our students of '93 and '94. This reflects credit on the students and also upon the work done by our instructors. It shows that improved methods will tell on the manufacture of butter, and in this way we hope to raise the standard of Canadian butter.

We had little difficulty in securing in the vicinity of Guelph the amount of milk required for the class to work with this year, while the previous year we were compelled to ship long distances by rail. We were compelled to pay a very high price the first year, but succeeded in reducing it somewhat in 1894, and we expect to be able to secure it at almost its commercial value in 1895. The chief expense has been in hauling, as drivers are compelled to go long distances for small quantities of milk. More farmers are now prepared to supply us, and I judge we shall have little difficulty in getting all the milk needed at a reasonable rate. Should we decide to continue our dairy school throughout the whole year, I think milk could be obtained at a much lower price, whereas at present on account of buying the milk for such a short time, farmers complain that it does not pay them to prepare for it unless they receive an extra price. There was also a difficulty in marketing our produce, as most of the dealers had already made their contracts for the season before ours were ready. The responsibility of the marketing fell on me, of which I should prefer to be relieved, especially when complaints were made as to the butter being "turnipy," "off flavor," etc. There is always more chance for the product being spoiled where there are so many doing the work, still on the whole the complaints were not so much as to the making as to the flavor, and the flavor is largely determined by the character of the milk. To secure an improved quality of milk for 1895, I called a meeting of the patrons and others interested on April 7th at the dairy, and laid before them some of our difficulties, and stated wherein we would like improvement.

I pointed out to them the fact that where the milk was sold it relieved the wife and daughters of much hard work during the winter, and that they would realize more by selling the milk than by keeping it at home in the majority of cases. I further pointed out the fact that our object was to teach, not to make money out of the milk bought from them, yet we should be able to purchase it at a price so that we would be at no loss. We would like them to be interested in the Dairy School and try to furnish us with the very best milk capable of being produced on their farms. For the success of our school, from a commercial standpoint, we need three things: good milk, skill in manufacturing, and judgment in marketing. We did not consider ourselves perfect, in fact we had much to learn, but if they would attend to the first requisite, we would do our best to secure the other two.

In milk of good quality two things are implied: First, that it be pure, sweet and of clean flavor; and secondly, that it contain at least 3.5 per cent. of fat. While there was a decided improvement in the quality of the milk during 1894 as compared with 1893 yet it was not all so good as it might have been. To secure the first qualities spoken of it was necessary to have clean stables, clean cows, clean feed and clean men and women. Milk should also be properly aërated in a place where the air is pure, and be cooled for butter-making. Owing to the fact that most of the milk was cold when it arrived at the dairy it was difficult to detect bad flavors until it was heated. We were compelled to send several lots home which were of bad flavor, and in one case a can was thick when it was brought in.

Some wished to send the Saturday night's milk, but I pointed out that it would suit us much better if it were used at home, chiefly for the reason that we required a regular amount each day, while the Saturday night's milk gave us an extra amount to handle on Monday and Tuesday. Then, again, it was too old in most cases, as it would not be all used before Tuesday. There were also complaints about the skim-milk being sour when it reached the farms. This is not to be wondered at, when in many cases the milk was sour or nearly so when brought in, and then it did not reach the farm again until the day after being skimmed. I intimated that we should pay for milk according to the percentage of fat next year, and that we could not accept milk from anyone who would persist in feeding turnips.

After some friendly discussion, the meeting adjourned. I am satisfied that it was productive of much good, and will result in an improved milk supply during the coming session. I attended a similar meeting at Arkell, some four miles from the College, as there were a number of patrons living in that vicinity who were unable to come to the dairy.

Home Dairy School.

There were some 8 or 10 students in this department during the term. Some stayed for a short time, while others were here most of the two months. There is still room for improvement in farm butter-making. The use of the separator in a dairy of 10 or more cows is becoming quite general, and to know how to regulate and care for these machines properly is very important, as with a person who does not understand how to use them they may be even more wasteful than the setting methods. Then, again, every farmer should be able to test samples of milk from the cows in his herd, and also to test the skim and buttermilk. These things are fully taught in the Home Dairy, and it is to be hoped more will avail themselves of this branch. The instructor, Mr. Rogers, is very painstaking and careful, and no one can spend two weeks or a month under his instruction without being greatly benefited.

There are four separators belonging to the Home Dairy, including the Alexandra, Nos. 3 and 8, the Baby Laval and the United States, with extractor attachment. About 800 pounds of milk were daily made into butter with such utensils as should be used in a farm dairy. This, together with milk-testing and some instruction in the cheese department and practice at the vats, comprised the practical work. The methods of setting milk were also explained, and some practice given. We have in the basement the Cooley creamer, Brampton creamer, shot-gun can method and shallow pans, so that students may become acquainted with these also if they wish.

At the close of the special class the regular College students came to the dairy for two weeks' practical work. Some were interested and did their work well, while others the instructors reported as being careless and indifferent Unless the College classes take more interest it is a question as to the advisability of continuing this work.

II.—EXPERIMENTAL WORK.

Experiments in Cheese-Making.

The question, which is better, to pay patrons of cheese factories according to the percentage of fat in their milk, or to pay them according to weight of milk? having been very much discussed at dairy conventions, farmers' institutes and in the press, it was decided to conduct, at the dairy department of the College, during the present year a series of experiments bearing on the point at issue. Besides this, we have asked about 75 cheese-makers in different parts of the province to co-operate with us in the work. The plan of the experiment is to make cheese at the dairy here for one week of each month throughout the season, beginning with May. The cheese-makers have been asked to make one experiment each month and send in the report on blank forms furnished by the Experimental Union in connection with the College.

We select normal milk with as wide a variation in the percentage of fat as we can get. Most of the milk used here has been supplied by our dairy and farm herds. In addition, we bought about 150 pounds per day from neighboring farmers. In all, five herds have contributed the milk used in the May and June experiments, which are here reported. Most of our cows give milk of good quality. We test each cow weekly by composite tests, and put the milk from all the cows testing over 3.6 per cent. into one can, and the milk testing under this into another can. To supplement this, a quantity sufficient to make up 600 pounds per day has been bought—chiefly poor milk. The chemical analyses of milk, whey, green cheese and cured cheese are made from month to month in the chemical laboratory.

The quantity of milk in each vat was 300 pounds. Two such vats of milk were made into cheese each day, under the same conditions as far as possible. The percentage of fat in milk and whey was determined by the Babcock method at the dairy. One ounce of rennet, diluted in 4 ounces of water, was used for each 300 pounds of milk in both May and June. No coloring was used in the milk. A rennet test was made of each vat every day. In making the test we added 1 dram of Hansen's Rennet Extract to 8 ounces of milk at a temperature of 86° F., and noted the time required for coagulation. During the month of May the rennet test varied from 9 to 18 seconds, with an average of 14 when set. In June the tests varied from 14 to 18 seconds—average 16.

The temperature at which the milk was set varied from 85° to 90°, but nearly all the vats were set in both months at 86°. The time required for coagulation varied from 11 to 28 minutes—average, 19 minutes in May; in June the variation was from 20 to 30 minutes, with an average of 23 minutes. All the curds were heated to 98° for cooking. They were dipped on showing about one-eighth of an inch of acid on the hot iron. All curds were milled with the Harris mill, and at a time about half-way between dipping and salting. In May the salting was done at the rate of 2 lb. per 1,000 lb. of milk. During June all curds were weighed when ready, and salted at the rate of $2\frac{1}{2}$ lb. per 100 lb. of curd. They were put to press in 15 or 20 minutes after salting. Pressure was applied lightly at first in a "gang" press, having a "spring head;" and after 40 to 60 minutes the cheese were bandaged and put back to press for about 20 hours. All cheese were weighed green with one press cloth on, and then put into the curing room. The May cheese were weighed again on June 2nd, and the June cheese on July 2nd.

In spite of extra care taken of our own milk some of the curds developed a peculiar flavor, and some were slightly gassy. A "starter" was used in some cases to hasten the ripening of the milk.

The table shows the difference in yield of cheese from milk with different percentages of fat for the two months. Three hundred pounds of milk were used in each case.

Date.	Per cent. fat in whole milk.	Lb. cheese.		Loss in curing.	Lb. milk for 1 lb. green cheese.	Lb. green cheese for 1 lb. fat in milk.
		Green.	Cured.			
April 30th	3.90	30.00	28.25	1.75	10.00	2.56
	3.35	27.50	25.50	2.00	10.91	2.74
May 1st	3.90	29.50	27.50	2.00	10.17	2.52
	3.60	27.00	24.50	2.50	11.11	2.59
" 2nd	3.60	29.75	27.50	2.25	10.08	2.76
	3.50	27.75	25.75	2.00	10.81	2.64
" 3rd	3.85	29.00	27.50	1.50	10.34	2.51
	3.40	28.00	26.50	1.50	10.71	2.75
" 4th	3.70	29.00	27.50	1.50	10.34	2.61
	3.70	29.00	27.50	1.50	10.34	2.61
" 5th	4.00	30.00	28.75	1.25	10.00	2.50
	3.50	28.00	27.50	0.50	10.71	2.67
" 7th	3.65	29.25	27.75	1.50	10.26	2.67
	3.30	27.50	26.00	1.50	10.91	2.75
June 4th	4.50	33.75	31.25	2.50	8.88	2.50
	3.20	28.25	26.25	2.00	10.62	2.94
" 5th	3.80	31.25	29.50	1.75	9.60	2.74
	3.40	30.00	28.25	1.75	10.00	2.92
" 6th	4.10	32.75	31.00	1.75	9.16	2.66
	3.60	29.75	28.00	1.75	10.08	2.75
" 7th	4.20	32.75	30.75	2.00	9.16	2.59
	3.80	32.50	30.50	2.00	9.23	2.85
" 8th	4.10	32.50	30.75	1.75	9.23	2.64
	3.70	31.00	28.75	2.25	9.67	2.79
" 9th	4.40	32.50	30.50	2.00	9.23	2.46
	3.90	29.75	28.25	1.50	10.09	2.55

The average percentage of fat for the seven days, April 30th to May 7th, was for one vat 3.80 and for the other 3.48. There were 2,100 lb. of milk used altogether in each vat. This amount of milk, testing 3.80 per cent. fat, made 206.5 lb. green cheese and 194.75 lb. cured cheese. The loss in curing was 11.75 pound. The average number of lb. green cheese made from 300 lb. milk was 29.5. The lb. of milk for 1 lb. of green cheese was 10.03—cured cheese 10.77. The lb. of green cheese made for 1 lb. of fat in the milk were 2.59. The average loss of fat in the whey as determined by the Babcock method was 0.26 per cent.

The other vat (2,100 lb.), averaging 3.48 per cent. fat, made 194.75 lb. green cheese—183.25 cured—loss in curing 11.5 lb. The average number of lb. of green cheese made from 300 lb. of milk was 27.82. The lb. of milk for 1 lb. of green cheese were 10.78—cured cheese 11.46. The lb. green cheese for 1 lb. fat in the milk were 2.68, The average percentage of fat in the whey was 0.25.

During the June experiments the vat of "rich" milk averaged 4.18 per cent. fat. 1,800 pounds of milk were used, which made 195.5 lb. green cheese—183.75 cured—loss in curing 11.75 lb. The average lb. cheese from 300 lb. milk were 32.58 green, 30.62 cured. The average lb. milk required to make 1 lb. cheese were 9.21 green, 9.79 cured. The average amount of cheese produced for 1 lb. fat in the milk was 2.60 lb. green and 2.44 lb. cured. Per cent. of fat in whey 0.19.

The vat of "poor" milk averaged 3.60 per cent. fat. 1,800 lb. milk made 181.25 lb. green cheese—170 cured; loss 11.25 lb. 300 lb. milk made 30.21 lb. green cheese—28.33 cured. Pounds of milk to make 1 lb. cheese, 9.95 green—10.59 cured. One pound of fat made 2.80 lb. green cheese—2.62 cured. Fat in whey, 0.19 per cent.

The cheese made from the "rich" and "poor" milk was scored by two competent judges. The following is the scale of points used by them:

Flavor	35
Closeness	20
Even color	15
Texture	20
Finish	10
	100

All cheese were scored full points for finish. The average score of the two judges of the cheese made from "rich" milk (3.80 per cent. fat) in May was 83 points. Cheese from "poor" milk (3.48 per cent. fat) scored 84 points. The cheese of June experiments were judged on July 6th by the same men. The average score of "rich" milk cheese (4.18 per cent. fat) was 91; that made from milk averaging 3.60 per cent. fat scored 93 points. The two cheese which scored the highest number of points in May and June were made out of milk testing 3.2 and 3.4 per cent. fat.

It is yet too soon to draw definite conclusions from our work, but so far it would indicate:

1. An increased percentage of fat in the milk gives an increased yield of cheese, though not in the same proportion.

2. That a pound of butter-fat in milk ranging from 3.2 to 3.7 per cent. will make more cheese than a pound of fat in milk ranging from 3.6 to 4.5 per cent. of fat.

3. That there need not necessarily be more loss of fat in whey from rich milk up to 4.5 per cent. fat than from poor milk, though we did notice a little more "grease" on the hoops, press and shelves from the rich milk cheese (4.5 per cent. fat.

4. That the milk containing the same per cent. of fat does not always give the same yield of cheese, especially when comparing one day with another or one month with another. April 30th, 300 lb. of 3.9 per cent. milk made 28¼ lb. cured cheese; May 1st, same quantity and quality of milk made 27½ lb.; June 9th it made 28¼ lb. May 1st, 300 lb. of 3.60 per cent. milk made 24½ lb. cured cheese; May 2nd, 27½ lb.; June 6th, 28 lb. May 4th both vats tested 3.7 per cent. and each made 27½ lb. cured cheese. June 8th, 3.7 per cent. made 28¾ lb. cheese.

This question has been a vexing one in factories, where payment by test has been adopted. It has been found that the yield of cheese does not always increase with the fat, and the discrepancy it doubtless due to differences in conditions of milk, methods of making, and state of the weather.

As some of our factories are still in doubt as to the advisability of distributing proceeds among patrons according to the percentage of fat in the milk, perhaps the following table will throw some light on the question.

Patron.	lb. milk.	Per cent. fat in milk.	Wt. cheese. lb.	Amount of money each would receive if cheese sold for 10c. per lb.				
				Paying by wt. of milk.	By per cent. fat	By reading + 1 per cent.	By reading + 2 per cent.	By wt. of cheese made.
				$ c.	$ c.	$ c.	$ c.	$ c.
May:								
H	2,100	3.80	194.75	18.90	19.73	19.54	19.44	19.475
L	2,100	3.48	183.25	18.90	18.06	18.25	18.37	18.325
June:								
H	1,800	4.18	183.75	17.685	19.01	18.73	18.56	18.37
L	1,800	3.60	170.00	17.685	16.36	16.64	16.81	17.00
July:								
H	1,800	3.84	184.00 (green)	17.41	18.91	18.58	18.37	18.40
L	1,800	3.23	164.25 (green)	17.41	15.91	16.24	16.45	16.42

In the table we have assumed that H and L are patrons, and during the months of May, June and July they furnished milk with the percentages of fat given. This milk was made up separately, so that we know how much cheese was made in each vat, or was furnished by each patron. Assuming that all the cheese netted the patrons ten cents a pound, if we divided the money between them according to the amount of milk sent, both of them would receive exactly the same amount of money, because the same quantity of milk was used in each vat. As the milk was made up separately (which would be the correct way in a factory if it were practicable, as every patron would have just the quantity and quality of cheese his milk entitled him to) we know the money value of the milk used in the vats. This is seen in the last column. If we compare the amounts of money in the first and second columns with those in the last, we find that neither of them gives justice, though the second (that according to the per cent. of fat in the milk) is much nearer than the first.

It has been felt by practical men that paying according to the fat alone gives the patron who furnishes rich milk more than his just share of the proceeds, and the patron sending the poor milk less than he is entitled to. This table would seem to indicate that this view is correct.

To overcome this difficulty it has been suggested by one of our prominent young dairymen of western Ontario to add one per cent. to each man's butter-fat reading. For instance, a patron who sends an average of 4 per cent. milk, call his test 5 per cent.; and one who sends 3 per cent. milk call it 4; and so on with all the tests. When this was first suggested, I was not favorably inclined towards the plan; but the results as seen in the table would seem to indicate that adding one or even two per cent. to the fat readings in these tests is more nearly correct than paying by weight of milk or by the fat alone.

We shall have further data on this point, and in the meantime we ask the co-operation of all cheese-makers and factories who are paying by test, to help to settle the question, as it is one that affects all patrons. Every factory that has a tester should select the patron's milk and put the poor milk in one vat and the rich in another. Note the per cent. fat, weight of milk used, yield and quality of cheese made from each, and send the results to the Dairy Department of the Ontario Agricultural College, Guelph. From the data thus secured we can more nearly arrive at the just method for all. Let every factory be a small experiment station until this point is settled.

THE CHEESE EXPERIMENTS CONTINUED.

The experiments reported in Bulletin No. 95, for the months of May and June, were continued through July, August, September, October and November. The same general plan was followed throughout these five months, as is given in detail in the bulletin. As the season advanced we were obliged to secure milk from a few herds in the vicinity to make up the quantity required. The milk was also ripened a little more, the curd was allowed a little more acid in the whey (not over $\frac{1}{4}$ inch on hot iron), and a little more salt was used (not over 3 lb. per 100 lb. curd).

The experiments for July were made from the 2nd to the 7th inclusive. As in the previous months, the quantity of milk in each vat was 300 lb. This was the amount used in all experiments. The rennet test varied from 8 to 18 seconds, with an average of about 16. The setting temperature was 86° Fr., rennet 1 oz. for each vat. The curds were dipped in about $2\frac{1}{2}$ hours from setting, though some "fast workers" were dipped in less time. Curds were ground with Harris' mill about half way between dipping and salting. Salt was used at the rate of $2\frac{1}{2}$ lb. per 100 lb. curd. One or two curds were "gassy."

In August the conditions were very similar to those in July, except that the curds were salted 3 lb. to the 100, instead of $2\frac{1}{2}$.

Table showing yield of cheese from different percentages of fat during July and August:

Date.	Per cent. fat in whole milk.	Lb. fat in milk.	Lb. cheese from 300 lb. milk. Green.	Lb. cheese from 300 lb. milk. Cured.	Per cent. fat in whey (Babcock tester.)
July 2nd	4.00 3.25	12.00 9.75	28.75 25.75	27.25 24.25	0.2 0.2
" 3rd	3.55 3.20	10.65 9.60	30.75 26.75	27.50 25.25	0.3 0.25
" 4th	3.80 3.20	11.40 9.60	31.00 27.75	29.25 26.00	0.5 0.4
" 5th	4.00 3.30	12.00 9.90	31.25 28.25	29.25 26.50	0.25 0.2
" 6th	3.90 3.40	11.70 10.20	31.50 28.75	29.75 27.00	0.2 0.15
" 7th	3.80 3.00	11.40 9.00	30.75 27.00	29.25 25.50	0.2 0.2
" 30th	3.90 3.20	11.70 9.60	27.75 26.75	26.00 25.00	0.4 0.15
" 31st	4.10 3.50	12.30 10.50	29.50 26.00	27.75 24.75	0.4 0.35
August 1st	3.90 3.20	11.70 9.60	29.50 26.50	28.25 25.00	0.25 0.20
" 2nd	4.10 3.35	12.30 10.05	31.50 27.50	30.00 25.75	0.25 0.25
" 3rd	3.80 3.05	11.40 9.15	30.00 26.75	28.25 25.25	0.15 0.15
" 4th	3.80 3.20	11.40 9.60	30.25 28.00	28.75 26.50	0.15 0.10

One vat averaged during July, 3.84 per cent. of fat, which yielded (from 1,800 lb. of milk) 184 lb. of green cheese and 172.25 lb. cured, when weighed on July 31st. The average of the other vat was 3.23 per cent. fat, which produced 164.25 lb. green and 154.5 lb. cured cheese. The average lb. of cured cheese from 300 lb. of milk was in the first case 28.7, and in the other 25.75—a difference of 2.95 lb. The loss in curing from the rich milk cheese was 11.75 lb, and from the other 9.75. The average pounds of milk for a pound of cured cheese where the per cent. of fat was 3.84, was 10.46; and where the per cent. of fat averaged 3.23, it took 11.66. The pounds of cured cheese to 1 lb. of fat in the milk, averaged for the richer milk 2.49 and the other 2.67. The per cent. of fat in whey was 0.275 and 0.27 for the two lots respectively.

During August the vats of richer milk averaged 3.93 per cent. fat, which produced 178.5 lb. green cheese—169 lb. cured. The vats of poorer milk, testing 3.25 per cent. fat, made 161.5 lb. green and 152.25 lb. cured cheese. The average pounds of cured cheese from 300 lb. milk was in the one case 28.16, and in the other 25.37. The loss in curing was 9.5 lb. from the 3.93 per cent. milk, and 9.25 lb. from the 3.25 per cent. milk. The average pounds of milk for 1 lb. of cured cheese in the first lot was 10.68, in the other 11.83 The pounds of cured cheese to 1 lb. fat was 2.39 and 2.56 respectively. The average per cent. of fat in whey was .26 from the richer milk and .20 from the poorer.

During the months of September, October and November there is nothing special to note regarding the method of manufacture. More "starter" was used, and the milk was usually in better condition. The following table shows the yields on the different dates:

Date.	Per cent. fat in whole milk.	Lb. fat in whole milk.	Lb. cheese from 300 lb. milk.		Per cent. fat in whey.
			Green.	Cured.	
September 3rd	4.00	12.00	32.50	30.5	0.10
	3.00	9.00	27.75	26.5	0.05
" 4th	4.00	12.00	31.25	29.25	0.10
	3.20	9.60	27.00	25.25	0.30
" 5th	4.00	12.00	30.50	29.00	0.10
	3.00	9.00	27.00	25.50	0.10
" 6th	3.80	11.40	31.25	29.75	0.10
	3.00	9.00	26.75	25 25	0.10
" 7th	4.10	12.30	32.25	31.75	0.10
	3.10	9.30	26.50	25.25	0.05
" 8th	3.90	11.70	30.50	29.50	0.05
	2.90	8.70	26.25	25.00	0.05
October 1st	4.00	12.00	32.75	31.00	0.15
	3.30	9.90	29.00	27.25	0.15
" 2nd	4.05	12.15	32.50	30.75	0.15
	3.60	10.80	30.50	28.50	0.10
" 3rd	3.90	11.70	32.75	31.00	0.10
	3.80	11.40	30.50	29.00	0.10
" 4th	3.80	11.40	31.25	29.75	0.15
	3.40	10.20	29.75	28.25	0.15
" 6th	4.00	12.00	32.50	31.00	0.15
	3.70	11.10	31.00	29.50	0.20
November 5th	4.00	12.00	32.00	31.00	0.15
	3.60	10.80	29.25	28.00	0.10
" 6th	3.65	10.95	32.25	31.00	0.20
	3.25	9.75	29.75	28.00	0.15
" 7th	3.75	11.25	30.25	29.25	0.10
	3.75	11.25	30.50	29.50	0.10
" 8th	3.95	11.85	31.25	30.00	0.15
	3.40	10.20	28.25	27.00	0.10
" 9th	4.05	12.15	31.75	30.75	0.10
	3.60	10.80	29.00	28.00	0.10
" 10th	3.90	11.70	32.50	31.25	0.15
	3.20	9.60	29.00	27.75	0.10

The averages for the three months are seen in the table :

Month.	Average per cent. fat.	Average lb. fat in vats.	Lb. cheese from 300 lb. milk.		Loss in curing lb.	Lb. milk for 1 lb. cheese.		Lb. cheese for 1 lb. fat.		Average per cent. fat in whey.
			Green.	Cured.		Green.	Cured.	Green.	Cured.	
September ...	3.97 3.03	11.90 9.10	31.38 26.88	29.96 25.46	8.50 8.50	9.56 11.16	10.01 11.80	2.63 2.95	2.52 2.79	0.09 0.15
October	3.95 3.56	11.85 10.68	32.35 30.15	30.70 28.50	8.25 8.25	9.27 9.95	9.77 10.52	2.81 2.82	2.59 2.68	0.14 0.14
November....	3.88 3.47	11.65 10.40	31.66 29.29	30.54 28.04	6.75 7.50	9.47 10.24	9.82 10.69	2.72 2.82	2.62 2.70	0.14 0.11

The average quality of the cheese was much superior during these three months. Though the per cent. of fat was about the same during July and August, yet the cheese was much inferior. This indicates that it is not alone the higher per cent. of fat which gives the fall cheese its superior quality, but we must look for the full explanation of the fact in other quarters—probably in the more favorable conditions of weather, which result in a better quality of milk supplied to the factories, and more favorable conditions for making and curing the cheese.

Table showing the results of the experiments for seven months :

Month.	Average per cent. fat in whole milk.	Total lb. milk.	Total lb. fat.	Lb. Cheese.		Lb. milk for 1 lb. cheese.		Lb. cheese for 1 lb. fat.		Average per cent. fat in whey.
				Green.	Cured.	Green.	Cured.	Green.	Cured.	
May	3.80 3.48	2,100 2,100	79.80 73.08	206 50 191.75	194.75 183.25	10.03 10.78	10.77 11.46	2.59 2.68	2.44 2.51	0.26 0.25
June.........	4.18 3.60	1,800 1,800	75.24 64.80	195.50 181.25	183.75 170.00	9.21 9.95	9.79 10.59	2.60 2.80	2.44 2.62	0.19 0.19
July	3.84 3.23	1,800 1,800	69.15 58.05	184.00 164.25	172.25 154.50	9.79 10.97	10.46 11.66	2.67 2.83	2.49 2.67	0.28 0.27
August.......	3.93 3.25	1,800 1,800	70.80 59.50	178.50 161.50	169.00 152.25	10.10 11.15	10.68 11.83	2.53 2.76	2.39 2.56	0.26 0.20
September ...	3.97 3.03	1,800 1,800	71.40 54.60	188.25 161.25	179.75 152.75	9.56 11.16	10.01 11.80	2.63 2.95	2.52 2.79	0.09 0.15
October......	3.95 3.56	1,500 1,500	59.25 53.40	161.75 150.75	153.50 142.50	9.27 9.95	9.77 10.52	2.81 2.82	2.59 2.68	0.14 0.14
November....	3.88 3.47	1,800 1,800	69.90 62.40	190.00 175.75	183.25 168.25	9.47 10.24	9.82 10.69	2.72 2.82	2.62 2.70	0.14 0.11

Being summed up, the seven months results show :

1. 12,600 lb. milk with an average of 3.94 per cent. fat yielded 1,236¼ lb. cured cheese, while the same quantity of milk testing 3.37 per cent. fat produced 1,123½ lb. cheese—a difference of 112¾ lb. cheese in favor of the richer milk. The difference in the average per cent. of fat is .57.

2. The average pounds of milk required to produce a pound of cured cheese from 3.94 per cent. milk was 10.19 ; from 3.37 per cent. milk the average was 11.22—a difference of 1.3 lb. milk in favor of the richer milk.

3. The average pounds of cheese produced from one pound of fat in the richer milk (3.94 per cent. fat) was 2.50, and from the poorer milk (3.37 per cent. fat) there was produced 2.65 lb cheese—a difference in favor of the poorer milk of 0.15 lb. cheese for each lb. of fat.

4. The loss of fat in whey, as determined by the Babcock tester, was 0.19 per cent. for the richer milk, and 0.18 per cent. for the poorer.

5. The cheese made from the richer milk shrank 5.2 per cent. when weighed at the end of a month, while the cheese made from poorer milk shrank 5.5 per cent. in the same time. The was little difference in the per cent. of shrinkage of the cheese made from the two lots of milk. The greatest shrinkage was during the months of May and June (and the richer milk cheese in July), and the least during November, but these latter cheese were not so well cured as the others.

The indications from the seven months' experiment confirm what was stated on page 137. "The results indicate that adding one or even two per cent. to the fat readings in these tests is more nearly correct than paying by weight of milk or by the fat alone."

It will be remembered that these experiments refer to normal milk, and cannot be compared with skimmed or watered milk. On the seven months' transactions, the patron sending the richer milk (3.94 per cent. fat) would receive six cents more than he should receive according to yield of cheese, and the other patron sending 3.37 per cent. milk would receive two cents. less than he ought, if the basis of adding on two per cent. to fat readings were adopted.

Table showing the amounts of money patrons would receive according to different methods of pooling, assuming that one patron furnished the high per cent. and another the low per cent. milk :

Month.		Av. per cent. fat in whole milk.	Lb. of cured cheese.	Amount of money each lot would receive if paid according to : Weight of milk, (cheese at 10 cents per lb.)	Per cent. fat.	Per cent. of fat +1 to fat readings.	Per cent. of fat +2 to fat readings.	According to weight of cheese made.
				$ c.	$ c.	$ c.	$ c.	$ c.
May		3.80	194.75	18 90	19 73	19 54	19 44	19 47
		3.48	183.25	18 90	18 06	18 25	18 37	18 32
June		4.18	183.75	17 68	19 01	18 73	18 56	18 37
		3.60	170.00	17 68	16 36	16 64	16 81	17 0C
July		3.84	172.25	16 33	17 74	17 43	17 24	17 22
		3.23	154.50	16 33	14 92	15 23	15 43	15 45
August		3.93	169.00	16 06	17 58	17 25	17 04	16 90
		3.25	152.25	16 06	14 54	14 87	15 08	15 22
September		3.97	179.75	16 62	18 86	18 36	17 87	17 97
		3.03	152.75	16 62	14 39	14 89	15 38	15 27
October		3.95	153 50	14 80	15 57	15 41	15 30	15 35
		3.56	142 50	14 80	14 03	14 19	14 30	14 25
November		3.88	183.25	17 57	18 57	18 34	18 21	18 32
		3.47	168.25	17 57	16 57	16 80	16 94	16 82
	lb. milk.							
Totals for 7 mos.	12,600	3.94	1,236.25	117 96	127 06	125 06	123 66	123 60
	12,600	3.37	1,123.50	117 96	108 87	110 87	112 31	112 33
Difference	....	0.57	112.75	....	18 19	14 19	11 35	11 27

The Cream Separator, Deep Setting and Shallow Pans Compared.

The experiment of 1893, comparing results obtained by creaming with the separator, deep cans or creamers, and shallow pans was continued through the months from April to November of 1894. The herd milk was all mixed together and then divided into three portions—one part was run through a hand separator (three kinds were used at various times—the Alexandra No. 8, Baby No. 2, and the United States hand size); another part was set in deep cans in ice water under the best conditions, and the remainder set in small shallow pans.

The results were:

Method of creaming.	Month.	Lb. milk creamed by each method.	Temp. set or separated.	Lb. cream.	Per cent. fat. Whole milk.	Per cent. fat. Skim milk.	Total lb. fat in each lot of milk.	Hours set.
			deg. F.					
Separator	April	180	90	32.00	3.3	0.17	5.94	....
Deep setting	April	180	90	33.50	3.3	0.20	5.94	12
Shallow pan	April	180	90	28.50	3.3	0.27	5.94	30
Separator	May	184	82	33.50	3.97	0.18	7.30	....
Deep setting	May	184	85	34.00	3.97	0.33	7.30	18
Shallow pan	May	184	85	30.00	3.97	0.40	7.30	29
Separator	June	180	92	30.00	3.72	0.18	6.69	....
Deep setting	June	180	92	33.50	3.72	0.20	6.69	13
Shallow pan	June	180	92	34.50	3.72	0.25	6.69	26
Separator	July	180	93	31.00	3.56	0.30	6.40	....
Deep setting	July	180	93	30.75	3.56	0.27	6.40	13
Shallow pan	July	180	93	23.50	3.56	0.40	6 40	28
Separator	August	175	90	26.00	3.73	0.23	6.52	....
Deep setting	August	175	90	31.00	3.73	0.30	6.52	24
Shallow pan	August	175	90	27.00	3.73	0.30	6.52	36
Separator	September	160	89	28.00	3.93	0.05	6.29	....
Deep setting	September	160	89	29.00	3.93	0.28	6.29	20
Shallow pan	September	160	89	25.00	3.93	0.33	6.29	36
Separator	October	180	94	28.75	3.40	....	6.12	....
Deep setting	October	180	94	29.50	3.40	0.20	6.12	16
Shallow pan	October	180	94	25.00	3.40	0.36	6.12	33
Separator	November	180	90	26.00	3.93	0.03	7.07	....
Deep setting	November	180	90	35.00	3.93	0.40	7.07	24
Shallow pan	November	180	90	40.00	3.93	0.23	7.07	36
Totals and averages—								
Separator	8 months	1,419	90	235.25	3.69	0.11	52.33	....
Deep setting	8 months	1,419	90	256.25	3.69	0.27	52.33	20
Shallow pan	8 months	1,419	90	233.50	3.69	0.32	52.33	32

It will be noticed that in November the quantity of cream was large, due to the fact that there was a great deal of skim milk in it. Practical dairymen know that the quality of cream obtained from a given amount of milk depends largely upon the percentage of the skim milk taken off with the cream, and no one can tell how much cream should be obtained from 100 pounds of milk unless he knows the degree of richness that is required. Yet this question is frequently asked.

The milk set in deep cans was set for an average of 20 hours and skimmed at an average temperature of 42° F., while the shallow pans were set for 32 hours and were skimmed at an average temperature of 54° F.

On 1,419 lb. milk, containing 52⅓ lb. fat, the loss in skim milk was 1.50 lb. of fat by the separator method—3.83 lb. by deep setting, and 4.54 by shallow pan.

During the tests of 1893 the loss of fat in skim and buttermilk from May to October (1,027 lb. milk in each method) was 0.47 lb. fat by the separator, 1.67 lb. by deep setting, and 3.29 lb. by the shallow pan method.

The per cent. of total fat lost in skim and buttermilk by the three methods for two years is—

	1893.	1894.
Separator	1.2	3.5
Deep setting	4.3	7.9
Shallow pan	8.5	9.6

The per cent. of fat lost is greater in all three methods during this year, although they hold the same relative positions as last year.

The cream from each lot of milk was churned separately and samples kept for testing as to keeping quality. In nearly every case the butter made from the separator cream was best at the end of two to four weeks. Just after churning there was not much difference in the three lots of butter.

The average time required to churn the separator cream was 26 minutes, deep setting 31 minutes, and shallow pan 35 minutes. The per cent. of fat in buttermilk was 0.175 from separator, 0.16 from deep setting, and 0.30 from shallow pan. In the actual yield of butter from the churn there does not seem to be the same differences as we might expect from losses of fat in skim and buttermilk, due no doubt to manipulation, as it is almost imposible to make several lots of butter containing the same percentage of moisture, salt, etc. The yield by the churn was 59½ lb. worked butter from 1,419 lb. milk by separator method, 59 lb. by deep setting, and 58 lb. 2½ oz. from shallow pan.

The difference would be greater than this, according to the manner of using setting methods, as commonly practised on the farm.

How Long Does it Take All the Cream to Rise on Milk Set in a Deep Pail?

This question was sent in to the dairy early in the year. As we had made no experiments in this direction, we carried on a series to determine, if possible, the length of time required for the cream to rise on deep pails set in ice water.

In August (from 9th to 15th) six trials were made. The milk was first mixed and then divided into cans which were skimmed at the end of 4, 8, and 12 hours. The average per cent. of fat in skim milk when skimmed at the end of 4 hours was .66 ; at 8 hours, .36, and at 12 hours, .275. In every trial, better results were obtained by allowing the milk to set 8 hours than 4, and 12 hours gave better results than 8 in each case but one, when they were equal. The gain was more marked at the end of 8 hours, as compared with 4 hours, than at the end of 12 hours, compared with 8.

From August 16th to 20th, four more trials were made, skimming at the end of 7, 9, and 11 hours, and in November, from 15th to 22nd, five trials were made, skimming at the same times. The average results were : .61 per cent. fat in skim milk at the end of 7 hours, .45 at the end of 9 hours, and .43 at 11 hours. The temperature at which the milk was skimmed ranged from 41° to 43° in all the experiments.

From December 4th to 13th, when we had a greater proportion of stripper cows, some further trials were made by skimming at the end of 12, 24, and 36 hours. The per cent. of fat in skim milk at 12 hours was .43 ; 24 hours, .32, and 36 hours, .28. Where milk from a large proportion of stripper cows is set in deep cans, it should be allowed to stand for 24 hours.

Similar experiments were made with shallow pans, skimmed at the end of 24 and 36 hours. During August (seven trials) the average per cent. fat in skim milk at 24 hours was .35, and at 36 hours, .22. In December (six trials), 24-hour setting, left an average of .42 per cent. of fat in skim milk, and 36-hour settings, an average of .24 per cent. of fat. The character of winter milk seems to be such that a longer time is required for the cream to rise perfectly, and we would advise 24-hour settings for deep pails, and 36 hours for shallow pan. We have also found a great difference in the "creaming quality" of different lots of milk. Some lots give up the cream quite readily at the end of 4 or 8 hours, while other lots contain .6, .7, .8 and .9 of 1 per cent. of fat in the skim milk at the end of the same period of time. The cream separator overcomes this difficulty.

Milk Set in Shallow Pans in Warm *vs.* Cool Temperature.

This is a continuation of the experiment of last year, in which we endeavored to secure data as to whether it was best to set milk in shallow pans in a warm place or whether a cool temperature would give equally good or better results.

In 1893, we reported that 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 temperature was 46° when skimmed the average per cent. fat in skim milk was .28.

The experiments were conducted similarly during 1894 in the months of May and November. The quantity of milk set in each temperature was 351 pounds. In each trial all the milk was mixed, then divided, and one lot set in a somewhat warm temperature, and one lot in a cooler place. The average temperature of one lot (12 tests) when skimmed was 54°, and the per cent. of fat in skim milk was .41. The other lot (12 tests) contained .36 per cent. fat in skim milk when skimmed at a temperature of 45°. There was not much difference in the 12 trials, but, in nearly every case, the lower temperature gave slightly better results.

Composite Testing.

As the labor in connection with testing milk at a cheese factory or creamery is considerable, we have been endeavoring for the past two years to arrive at a method which will insure accuracy, and at the same time entail as little labor as possible. Taking out from one-half to one fluid ounce with a small dipper from each patron's milk every time it is delivered, we think is about the most practicable way of sampling. Pint or quart jars properly labelled, and having quickly removable covers, are about the best things to keep the samples in. Potassium bi-chromate, costing from 15 to 25 cents a pound, is a good preservative. Last year, from a somewhat limited number of experiments, we stated that samples might be kept for one, two, three or four weeks, and yet give accurate tests. These experiments have been continued through the months from April to November during 1894, with satisfactory results, as the following figures show :

Month.	1st week.				2nd week.				3rd week.				4th week.			
	Average per cent. of fat, daily tests.		Per cent. of fat in jar.		Average per cent. of fat, daily tests.		Per cent. of fat in jar.		Average per cent. of fat, daily tests.		Per cent. of fat in jar.		Average per cent. of fat, daily tests.		Per cent. of fat in jar.	
	No. 1	No. 2	No. 1	No. 2	No. 1	No. 2	No. 1	No. 2	No. 1	No. 2	No. 1	No. 2	No. 1	No. 2	No. 1	No. 2
April	3.49	3 30	3.40	3.15	3.19	2.76	3.10	2.75	....	.. .	....	....	...	....	....	....
May.	3.77	2.94	3.95	3.00	3.45	2.47	3.30	2.45	3.02	2.51	2.75	2.45	2.80	3.00	2.60	3.30
June..	5.70	5.11	5.65	5.20	4.25	3.69	4.20	3.55	3.75	3.36	3.80	3.25	....	....	....	....
July..........	3.73	3.47	3.60	3.40	3.71	3.47	3.60	3.50	3.52	3.35	3.60	3.30	3.51	3.27	3.45	3.25
August.........	3.09	2.57	3.20	2.60	3.10	2.53	3.00	2.60	3.06	2.66	3.01	2.70	3.12	2.76	3.15	2.80
September......	2.99	3.47	2.80	3.70	3.37	3.31	3.35	3.40	3.36	3.39	3.40	3.50	..	....	....	....
October	3.75	3.07	3.80	3.05	3.76	3.17	3.80	3.20	3.52	3.19	3.50	3.15	3.63	3.36	3.65	3.40
November	3.01	3.60	3.00	3.50	3.36	3.50	3.40	3.50	3.10	2.87	3.11	3.30	2.87	3.09	2.85	3.10
Average....	3.69	3.44	3.67	3.45	3.52	3.21	3.47	3.12	3.33	3.10	3.30	3.09	3.18	3.09	3.14	3.17

It will thus be seen that the widest variation in the average of daily tests for one, two, three or four weeks is not over two-tenths of one per cent., when compared with the test of the composite sample for the same time, and in most cases they compare very closely. When we compare the averages for the eight months the results are quite close. The average daily tests for one week in No. 1 experiment was 3.69, the composite test for one week was 3.67. In No. 2 experiment the average of daily tests was 3.44; the jar tested at the end of a week 3.45 per cent. fat. For two weeks the average of No. 1 was 3.52, the composite test 3.47; in No. 2 the tests were 3.21 and 3.12 respectively. For three weeks the tests were 3.33 and 3.30 in No. 1, and 3 10 and 3.09 for No. 2. At the end of one month or four weeks, the average of the daily tests was 3.18 in No. 1, and 3.09 for No. 2. The jars tested 3.14 and 3.17 per cent. fat.

These were two distinct experiments. In some cases the jars tested nearly alike, though the same kind of milk was not always put into both jars. We may conclude that composite testing for four weeks may be practiced with accurate results, though in factory or creamery work it may not be advisable to continue them longer than two weeks.

Though the composite test has proven itself to be correct, it occurred to us that where the amount of milk varies from day to day, as it usually does from a herd, it might make a difference in the total quantity of fat credited to a patron, if we tested the milk every day and multiplied the pounds of milk by the test, or took the total amount of milk delivered during any given period, say one week, two weeks or a month, and multiplied this by the test for the same period. Where both quantity and quality vary from day to day and we do not take out an aliquot part, the total pounds of fat would be quite different by the two plans, so some have said. To get some data on this point we arranged a pair of scales in the separator room at the farm, on which we placed the receiving vat of the separator containing the milk of our herd night and morning. The milk was weighed, and samples taken before being allowed to run into the separator, and at the same time a composite sample was taken.

During the month of June, 18 milkings were tested in this way. The pounds of milk at each milking varied from 2.15 to 2.95 (June 12th to 21st), and the per cent. of fat in the milk varied from 3.15 to 4.30. The total pounds of milk tested during this period was 4,472, which contained an average of 3.7 per cent. fat. The composite test was also 3.7. The total pounds of fat obtained by multiplying each day's milk by the per cent. of fat was 163.55 and by the composite test 165.46. The difference is 1.91 lbs. fat on 4,472 lb. milk for 18 milkings in June. To illustrate how this difference may occur, we give the pounds of milk and daily tests for June:

——	Pounds of milk.	Percentage of fat.	Pound of fat.
June 12, p.m	274	3 40	9.31
" 13, a.m	281	3.30	9.27
" 13, p.m	270	3.80	10.26
" 14, a.m	270	3.20	8.64
" 14, p.m	254	3.50	8.89
" 15, a.m	274	3.90	10.68
" 15, p.m	266	4.30	11.44
" 16, a.m	225	4.00	9.00
" 16, p.m	242	3.60	8.71
" 17, a.m	295	3.70	10 91
" 17, p.m	194	3.90	7.56
" 18, a.m	261	3.15	8.22
" 18, p.m	221	3.85	8.50
" 19, a.m	243	3.35	8.14
" 19, p.m	215	3.90	8.38
" 20, a.m	234	3.70	7.66
" 20, p.m	222	4.20	9.32
" 21, a.m	231	3.75	8.66
Total	4,472	3.70	163.55

In July, 29 milkings (from July 9th to 27th) were tested in a similar manner. The total pounds of milk were 6,141, which tested on an average of 3.65 per cent. of fat by the daily tests. The composite test was 3.60. The pounds of milk varied from 158 to 252; the per cent. of fat varied in the different milkings from 3.0 to 4.45. The total pounds of fat as determined by daily tests was 223.54, and 221.07 by the composite test—a difference of 2.47 pounds fat on 6,161 pounds milk.

During August the tests continued from the 6th to the 30th—40 milkings in all. The pounds of milk varied from 119 to 235 and the daily test from 2.90 to 4.00 per cent. of fat. The lowest number of pounds of fat given at one milking was 4.28, and the highest 8.09. The average per cent. of fat for all the milkings was 3.51, and the composite test was 3.55. The total pounds of fat credited by testing each milking was 255.39 and by the composite test 258.90—a difference of 3.51 pounds on 7,293 pounds milk.

For September the average of daily tests was 3.75—composite test 3.80. The total pounds fat credited by testing each milking (29) was 185.36, and by composite test 188.59—difference, 3.23 pounds fat on 4,963 pounds milk.

The October experiments continued from the 6th to the 27th (39 milkings.) The pounds of fat credited by daily tests (3.55) was 342.09—composite test (3.55) 343.71—difference 1.62 on 9,682 pounds milk.

In November the tests continued from the 2nd to December 1st—(34 milkings). The pounds of milk varied from 180 to 301—The per cent. of fat from 3.4 to 4.60. The average of the tests of the separate milkings was 3.76, while the composite test was 3.75, The fat credited by testing each milking was 318.13, and by the composite test 318.82—a difference of but .69 pound fat on 8,502 pounds of milk.

Several valuable lessons may be learned from this experiment:

1. We have added proof of the correctness of the composite test, if that were necessary.

2. The pounds of fat credited to different patrons is nearly correct by adopting the composite test and multiplying this on the total pounds of milk delivered. The greatest variation from the correct amount was during August, when the difference was about 3½ pounds of fat on 7,300 pounds of milk. In October the difference was but 1.62 pound of fat in 9,582 pounds milk, and in November there was less than 1 pound difference on 8,502 pounds milk. In all the months, except July, the composite test plan gave slightly higher results in total fat than the tests made from each milking.

3. Although not one of the objects of the experiment, we may also learn the amounts of milk given morning and evening, and the percentage of fat in the milk of our herd from June to December 1st. Not all the milkings are included, nor are they all the same cows. Some cows were drying up and some were fresh, similar to what occurs in any large herd where a regular supply of milk during the year is aimed at. The results of morning and evening milkings for each month are comparable if we make allowance for the fact that about 1½ gallons of milk is sold to customers each evening. The table will best show the results:

Month.	Average pounds of milk given by the herd. a.m.	p.m.	Difference.	Average per cent. of fat in herd milk. a.m.	p.m.	Difference.
June	257	240	17	3.56	3.83	0.27
July	223	198	25	3.51	3.83	0.31
August	199	164	35	3.89	3.62	0.27
September	184	154	30	3.61	3.96	0.35
October	269	227	42	3.45	3.66	0.21
November	273	221	52	3.70	3.86	0.16

It is thus seen that the cows invariably gave most milk in the morning, which is accounted for to some extent (1) by the fact that there is a slightly longer time between the night and morning milking than between morning and night—a difference of from half to three quarters of an hour ; (2) for the reason that customers get milk in the evenings. The milk, however, averaged a higher percentage of fat in the evening for the six months. In some cases, the morning milk was higher in fat percentage. That the fat varies considerably from one milking to another, is seen in the following instances :

		Percentage of fat.
July 9th......	a.m.	3.5
	p.m.	4.4
July 10th......	a.m.	3.5
	p.m.	3.9
July 13th......	a.m.	3.0
	p.m.	4.0
July 27th......	a.m.	3.35
	p.m.	4.45
August 15th ..	a.m.	3.20
	p.m.	3.90
September 11th.	a.m.	3.50
	p.m.	4.30
November 18th.	a.m.	3.70
	p.m.	4.60

We may, therefore, expect considerable variation in herd milk from day to day in both quantity and quality.

Composite Cream Tests with Oil Test Churn.

A correspondent early in the creamery season asked us if we had ever tried the composite test with cream which was to be tested with the oil test churn. As we had not done so a series of experiments were undertaken to see if this were practicable. Samples of cream were put in a jar and potassium bichromate added, to keep it from souring too much. Tests were made at the end of a week ; but they were not satisfactory. Some of them gave good separation and clear readings, while others did not ; but the chief difficulty was in the wide difference between the reading of the composite sample and the average of the single tests. So far this plan has not proved a success with us, and we should like some further trials before pronouncing definitely on the feasibility or failure of this method. If practicable, it would save considerable labor at the creamery.

Experiments on the Effect of Food on Milk.

On May 14th our cows were turned out to pasture. There were 19 milking at that time, and we divided them into two groups. Group I received a meal ration of 4 lb. bran, 3 lb. wheat and 1 lb. cottonseed meal, in addition to pasture, while each cow in Group II received but 1 lb. bran per day, just enough to entice them to their stalls.

For the week ending May 13th, while the cows were in the stable and receiving their regular winter ration, Group I (10 cows), gave 1,863 lb. milk, with an average of 3.84 per cent. fat. During the next three weeks, they gave a weekly average of 1,820 lb. milk and 4.21 per cent. fat. This by itself looks like an increase in per cent. of fat, which might be attributed to the meal fed ; but Group II (9 cows), for the week previous to the experiment, gave 1,821 lb. milk and 3.4 of an average percentage of fat, and for the three succeeding weeks when on pasture and no meal (except 1 lb. bran each daily), their weekly average was 1,754 lb. milk and 3.85 per cent. fat. Group I gained .37 per cent. fat and Group II .45. Group I failed to the extent of 43 lb. milk and Group II, 67 lb. milk. We evidently were not paid for the meal on good pasture. As the pasture was excellent at the close of this period (June 3rd), allowing one intervening week, on June 10th all the cows were put upon a ration consisting of pasture alone, except a little bran to assist in tying the cows in the stables for milking.

The weekly record for three weeks without meal, from June 10th to July 1st, of Group I, was 1,707 lb. milk and 3.77 per cent. fat. Group II gave an average weekly record of 1,742 lb. milk and 3.54 per cent. fat. Both groups decreased in quantity and per cent. of fat in milk during this period as compared with the previous period. Group I decreased on an average for one week 113 lb. milk and .44 per cent. fat. Group II decreased 12 lb. milk and .31 per cent. fat.

From July 1st, when the pastures began to fail, to July 22nd, both groups were fed 2 lb. bran and 2 lb. wheat to each cow daily, and July 10th one pound of cottonseed meal was added to the daily ration on account of the pastures drying up. The weekly average for Group I in this period was 1,498 lb. milk and 2.82 per cent. fat. Group II gave 1,601 lb. milk and 3.56 as a weekly average. The milk from each cow was weighed night and morning and samples were also taken and tested weekly by composite test plan.

If we compare the last period where all the cows received meal, with the previous period where practically no meal was fed in addition to the pasture, we find that Group I decreased in milk flow by 209 lb. per week and there was but .05 per cent. difference in the average of the fat. Group II decreased 141 lb. milk, while the per cent. of fat remained practically the same—a difference of but .02 per cent. in the weekly average.

The data for all the experiments is conveniently summed up in the following table :

Group I.				Group II.			
Week ending	Weekly average.		Ration.	Week ending	Weekly average.		Ration.
	Pounds milk.	Per cent. fat.			Pounds milk.	Per cent. fat.	
May 13th	1,863	3.84	Ensilage, hay and meal (in stable on winter ration.)	May 13th ...	1,821	3.4	Winter.
June 3rd (3 weeks)...	1,820	4.21	Pasture and 4 lb. bran, 3 lb. wheat and 1 lb. cottonseed meal.	June 3rd (3 weeks ...	1,754	3.85	Pasture without meal.
July 1st (3 weeks)...	1,707	3.77	Pasture without meal.	July 1st (3 weeks)...	1,742	3.54	Pasture without meal.
July 22nd (3 weeks)...	1,498	3.82	Pasture and 2 lb. bran, 2 lb. wheat and 1 lb. cottonseed meal.	July 22nd (3 weeks)...	1,601	3.56	Pasture and 2 lb. bran, 2 lb. wheat and 1 lb. cottonseed meal.

Slopping Cows.

Further experiments were made in November and December to see the effect that "slopping" cows would have on quantity and quality of milk. Nine cows were used in this trial. Their record for two weeks previous to "slopping," for two weeks in which they were "slopped" once a day, and for two weeks in which "slopping" twice a day was practised, is seen below.

The meal ration at this time consisted of 2 lbs. ground wheat and 4 lbs. bran. While the cows were slopped once a day, half of this amount of meal was given dry and the other half in the form of warm slop. When slopping twice a day was followed, this quantity of meal was given at two feeds. Besides the meal, they were getting some silage and pasture during the day for a part of the time, when the weather was favorable.

Some of the cows increased in the quantity of milk and in the percentage of fat, while others decreased during the period of slopping once a day. The difference in the percentage of fat was .14 for the group in the first period and .1 in the second when compared with the dry feed period.

Name of cows.	Record for 2 weeks previous to experiment. Oct. 8 to 21.		Record for 2 weeks when "slopped" once a day.		Record for 2 weeks when "slopped" twice a day.	
	Pounds milk.	Per cent fat	Pounds milk.	Per cent. fat.	Pounds milk.	Per cent. fat.
Bella	389	3.50	403	3.60	327	3.55
Violet	457	3.45	444	3 50	410	3.35
Bessie	420	3.45	466	3.30	429	3.45
Pansy	451	3.20	465	3.15	448	3.10
Annie	368	4.00	427	3.90	420	3.75
Clara	468	3.55	444	3 30	401	3.20
B. Temple	249	5.75	273	5.20	283	5.65
L. Rose	260	4.75	235	4.60	222	4 80
Totals and averages	3,062	3.96	3,157	3.82	2,940	3.86

After an intervening period of one week, six of these cows—Bella, Violet, Bessie, Pansy, Annie and Clara, were given nearly all their drink in the form of slop. For the first few days the covers of the water boxes were not properly fastened down, but after this they were given all the warm slop they would drink and no water. The average of the six cows for the week beginning Nov. 19th previous to slopping was 1,110 lb. milk and 3.60 per cent. of fat. The weekly average for the two weeks on warm slop feed was 1,085 lb. milk and 3.63 per cent. of fat—a decrease in the quantity of milk by 25 pounds, while the per cent. of fat remained about the same.

In 1893, we said in the report on slopping cows—"This experiment would indicate that slopping is an expensive way to feed cows" We would say again that there does not appear to be any advantage in feeding cows wet meal, nor is there evidence to prove that this method of feeding will make the milk poorer in fat to any extent.

Experiments in the Piggery.

Two experiments were made in the piggery, one to determine the relative value of wet and dry meal fed to pigs, and the other comparing sweet milk with sour milk.

The first was with seven Berkshire grade pigs that had been bought to consume the milk from the dairy. The meal fed was middlings wet with milk (during part of one week whey was used) into a form of slop as is customary with feeders of pigs, and a few dry, whole peas were also fed. The experiment commenced on April 16th and continued three weeks. At the beginning of the experiment, the lot of seven pigs weighed 1,039 lb.—average 148 lb. each—and at the close they weighed 1,181 lb.—a gain of 142 lb. they consumed in this time 2,188 lb. skim milk, 675 lb. whey, 433 lb. middlings and 15 lb. peas.

In the second period from May 7th to May 28th the increase was 171 lb. when fed dry middlings. The drink was given separately. They ate 508 lb. dry middlings, 25 lb. peas, and drank 2,313 lb. skim milk.

Assuming that the whey is worth one quarter as much as the skim milk, the amount of liquid food in the two periods is nearly the same. During the first period 448 lb. meal (chiefly wet) produced a gain of 142 lb., while in the second (dry) it took 533 lb. meal to produce a gain of 171 lb. Wet meal produced a gain of one pound of flesh for 3.2 lb. meal and dry meal a gain of 1 lb. flesh for 3.1 lb. meal. This is practically the same amount of meal to produce a pound of gain, whether fed wet or dry. The pigs seemed to waste more meal when fed dry.

Experiment No. 2 in which sweet and sour milk were fed at the same time to grade Tamworth hogs, commenced on April 16th also. We had 11 of these pigs, which were divided into two pens, one lot fed on sweet milk and the other on sour. In the first period, from April 16th to May 7th, some whey was also fed. Pen No. 4 (6 pigs) weighed 846 lb. at beginning of experiment and 1,013 lb. at the end of 3 weeks—a gain of 167 lb. During this time they ate 400 lb. middlings, and 15 lb. peas, and drank 2,475 lb. sweet skim milk and 890 lb. whey. The other pen (No. 5, with 5 pigs) weighed 726 lb. at beginning, 917 lb. at close—a gain of 191 lb.—and consumed 370 lb. middlings, 15 lbs. peas, 2,410 lb. sour, skim and buttermilk, and 875 lb. whey.

On May 7th the pen which had been fed on sour milk, was fed on sweet milk and meal. During three weeks they gained 212 lb. They consumed 2,710 lb. sweet skim milk, 550 lb. middlings, and 35 lb. peas. The other lot, which had been getting sweet milk, were changed to sour milk during the same time, and made a gain of 247 lb. on 2,775 lb. sour skim milk and buttermilk, 580 lb. middlings, and 30 lb. peas.

Summing up the averages of both lots when fed on practically the same amount of feed for the six weeks, we have a gain of 379 lb. for the sweet milk periods and a gain of 438 lb. for the sour milk periods—a gain of 59 lb. in favor of the sour milk. This experiment would indicate that sour milk is equal to or better than sweet milk for pigs, weighing from 140 to 200 lb., as an economical producer of gain.

III. DAIRY STOCK.

We have at present 28 dairy cows, including one pure-bred Ayrshire, one Holstein, and three Jerseys. The others are grade animals, bought during the spring and fall at prices ranging from $35 to $50. We have also four Jersey calves (one bull and three heifers), and one yearling Jersey heifer, one Ayrshire bull calf, one Holstein and three grade heifer calves, eighteen pigs, and one horse.

To have some cows fresh during all seasons of the year, with the greater number calving spring and fall, is our aim at present.

Several of those bought in the spring have been sold for beef or exchanged for fresh milkers during the autumn. As stated in previous years, we do not wish to keep any cow that will not attain to our standard of 6,000 lb. milk or 250 lb. butter in a year. As has been our custom in the past, we have kept a record of the lb. milk given by each cow, together with a weekly test of butter-fat throughout the whole year.

As indicated in my last report, the greater part of our herd was lost during the winter by tuberculosis. On December 27th, 1893, most of the animals were slaughtered. All of the cattle were removed from the stable and the whole inside thoroughly white-washed twice with hot lime, and all the mangers and stalls washed first with carbolic acid water, so as to disinfect the stable.

Nine head were isolated for experimental purposes by the veterinary surgeon, on which he will no doubt report.

The loss which I felt greatest was a number of grade heifers due to calve in the spring, which had been raised from our best cows and from the dairy stock bulls. I hoped to have soon had a herd of our own rearing, but all were sacrificed and we are compelled to start again.

Record of Dairy Herd for 1894.

Owing to the fact that there have been so many changes in our herd during the past year, it is very difficult to give a satisfactory record. Of the 29 cows whose record is given, but 4 of them have been in our herd for the entire year. Some were bought late in the fall, and consequently we have their record for but a limited period. It is interesting to note that nearly all the cows average over a pound of butter per day for the record given. The cow Spot is a grade cow, showing some Ayrshire blood. Her record is nearly 9,000 lb. of milk and 370 lb. butter. The cow Bella is also a grade, showing Shorthorn blood. Her record is over 8,000 lb. of milk and over 300 lbs. butter.

The milk of each cow is weighed night and morning, and weekly composite tests made of night's and morning's milk. The highest per cent. of fat is the highest *weekly* test, and the lowest the lowest weekly test. The average is the average of all the weekly tests during the time reported.

Yearly Record of Dairy Cows Ending Dec. 2nd, 1894.

Name of cow.	Weight.	Calved.	Bred.	No. days milking.	Total lb. milk.	Per cent. fat. Highest.	Per cent. fat. Lowest.	Per cent. fat. Average.	Total lb. fat.	Lb. milk to 1 lb. fat.	* Total lb. butter.
Lisgar's Rose	1,078	April 12..	October 29	214	5,150	6.2	3.55	4.7	242.8	21.28	266.24
Bashful.....	1,265	May 19...	....	182	3,774	4.0	2.90	3.58	135.1	28.0	148.6
Belle Temple	900	July 18...	Dec. 24 ..	164	3,200	6.6	4.6	5.61	179.5	17.8	197.47
Blossom	1,220	August 29	Nov. 12 ..	95	2,537	3.7	3.0	3.46	87.80	28.9	96.58
Fanny	1,190	June 29..	....	70	1,894	3.8	2.7	3.39	64.2	29.5	70.62
Violet	1,020	Sept. 8...	October 29	90	2,791	3.8	3.1	3.47	96.84	28 8	106.5
Maria	1,115	October 3.	Nov. 3 ...	59	1,486	3.8	3.2	3.49	51.86	28.6	57.04
Bessie	1,030	Sept. 30..	October 15	61	1,904	3.8	3.1	3.42	65.11	29.2	71.72
Clara	1,255	October 1.	Nov. 4 ...	60	1,866	3.8	3.0	3.41	63.63	29.3	70.00
Pansy	1,030	Sept. 29..	Nov. 5 ...	61	1,963	3.6	3.1	3.24	64.58	30.4	71.03
Annie	920	October 10	Nov. 2 ...	53	1,507	4.2	3.5	3.95	59.5	25.3	65.47
Birdie	1,100	October 15	....	49	1,366	4.2	3.6	3.92	53.54	25.5	58.89
Alice 1st....	....	....	....	219	5,497	3.82	3.0	3.27	189.5	28.9	208.61
Alice 2nd ...	1,105	Nov. 1 ...	....	32	811	4.9	4.3	4.75	38.52	21.05	42.37
Starlight....	1,315	October 9.	....	18	647	3.9	3.4	3.65	23 61	27.4	25.97
Lisgara	1,171	Sept 18,'93	July 21 .	217	3,680	6.45	4.2	5.19	191.0	19.26	210.0
Margaret ...	1,484	October 26	....	217	6,249	4.2	2.95	3.61	225.59	27.7	248.14
Spot	1,185	Feb. 1...	April 12..	312	8,849	4 4	3.3	3.80	336.2	26.3	369.88
Rebecca	1,150	March 9..	April 9...	270	7,068	6.1	3.0	3.62	255.86	27.6	281.4
Queen	1,240	March 7..	April 9...	270	6,741	4.1	2.9	3.5	235.9	28.5	259.5
Lilly	1,275	Feb. 12...	March 12.	259	5,425	4.6	3.3	3.7	200.7	27.0	220.7
Jessie.......	1,315	March 27.	May 28...	254	6,164	4.7	2.6	3.63	223.75	27.5	246.12
Bella	1,465	March 9..	April 22..	251	8,167	4.25	2.9	3.53	287.6	28.3	316 33
Carrie	1,295	October 7.	....	252	6,295	4.4	3.2	3.97	249.9	25.2	274.9
Patience	1,275	March 27.	April 27..	238	6,861	4.6	3.2	3.9	267.6	25.6	294.33
Fancy	1,080	Nov. 25 ..	....	154	2,728	4.72	3.5	4.0	109.1	25.0	120.0
Naucy ...	1,085	Nov. 31 ..	....	140	2,030	4.6	3.5	4.14	84.04	24.15	92.44
Jennie	1,140	April 1..	June 16 ..	245	6,733	3.7	2.7	3.14	211.41	31 8	232.55
Filpail	1,240	March 23.	April 23..	227	6,708	3.6	2.7	3.38	226.7	29.5	249.4

*Calculated by adding one-tenth to the butter-fat.

On June 7th, according to the arrangement made by you with our veterinary surgeon, Dr. Reed, about 18 cows were dehorned. Some of the animals appeared to suffer considerable pain and quite a loss of blood while others did not appear to mind it a great deal. There was little, if any, less milk on the days after dehorning, though the percentage of fat fell off to some extent. The average percentage of fat in the milk of 22 cows, most of which were dehorned, for the three days previous to dehorning was 3.9 while for the four days after dehorning it was 3.36. The average per cent. of fat of the four cows not dehorned was 4.0 for 3 days before and 4.3 for the 4 days after dehorning.

The chief feed for our cows during the winter is corn silage. We are indebted to the farm department for filling our silo, for a quantity of mangels, hay and straw, and help at various times during the year. During the summer, while the pasture was good, our cows got no meal except for experimental work. When pasture became poor we fed some corn silage and 2 lb. bran, 2 lb. ground wheat and 1 lb. cottonseed meal.

The cows are turned out to pasture May 14th.

From our limited experience with corn silage, and from the reports of dairymen who have used it during the summer, I am satisfied that this food will play an important part in the rations of cows during the summer when pasture is scarce. During August and a part of September three cows were kept in the stable and fed on soiling or green crops. Owing largely no doubt to the fact that they fretted considerably in the stable we did not find the flow of milk increase to any extent; in fact, it scarcely kept up to the normal. Animals appear to like some freedom, and we must humor the cow in some ways if we are to get the most from her.

The horn-fly pest caused a good deal of annoyance during the summer. We tried various plans, but found that a mixture of train oil and carbolic acid rubbed well into the hair once or twice a week was the most effectual remedy, in the proportion of one tablespoonful of the crude acid to a quart of the oil, rubbed lightly all over the animal with a sponge.

The Alexandra cream-separator No. 3, run by tread power in the annex to the dairy stable, has been entirely satisfactory during the year. Some similar plan to this is perhaps the best method of creaming milk on a farm where ten or more good cows are kept. For full particulars of our buidling, power, etc., I would refer readers to the report of last year. We used a horse on the power most of the time, but on some occasions when the horse was not in the Ayrshire bull was put on and gave entire satisfaction. Dairymen have by this method an excellent plan of exercising the bull, and it will do him no harm—in fact, it will be good for him.

The manure shed in connection with the dairy stable has leaked more or less during the year. We have recently banked it up on the inside with dirt, and hope it may be remedied. The yard needs a coat of gravel and the buildings need eave troughs. I hope this may be done during next year.

During the month of January I bought 47 hogs to consume the skim milk from the dairy school. To accomodate these it was necessary to make temporary pens. If we can otherwise dispose of the skim milk I think it would be better, as we have not sufficient pen-room for the number of hogs needed to use all the milk. The whey from the cheese department I sold in bulk to a farmer who drew it away each day from the dairy.

We keep sufficient hogs to use the skim milk, buttermilk and whey from our own cows. In the past we have bought these, but at present we are aiming to raise them.

IV. TRAVELLING DAIRY.

It was decided this year to continue the work done by the travelling dairy, but to send only one team and one set of instructors instead of two as in former years.

As there was no available man at the beginning of the season, you decided that it would be best for me to take charge until a suitable person could be obtained. Accordingly I, with Mr. Hume, the butter maker, proceeded on May 12th to the first meeting in Halton county, at the village of Brookville. Meetings were also held at the following places in this county: Georgetown, Milton, Nelson, Palermo, and Postulle. At all of these places great interest was manifested; especially at the Milton meeting the attendance was large and the interest good. The farmers had recently erected a cheese factory near the town, and were fully alive to the importance of the dairy question. Previously they had been engaged in private dairying and shipping milk to Toronto. I am pleased to note that several factories are likely to start in the county, no doubt, largely the result of the work done by the dairy. This is the invariable result where there are no cheese factories or creameries previous to the visit of the travelling dairy. The president, secretary and members of the Farmers' Institute did good service in advertising the meetings and in assisting to make the tour a success. I am personally indebted to them for their kind hospitality and favors shown.

In the county of Peel I was in charge at Streetsville, Huttonville, Edmonton, Cheltenham, Belfountain, Alton, Charleston, Caledon East, and Tullamore. After this, Mr. Sleightholm, a graduate of 1894, assumed the responsibility. I am pleased that he has succeeded so well. Favorable reports have been received of his good work.

During my stay in Peel it rained nearly every day, and any one who knows the character of the roads in this county can imagine that we did not have a very pleasant time travelling about. The weather, no doubt, tended to make the attendance small in some places. In spite of bad weather the gatherings were nearly all good and the discussions brisk and to the point. We found a good many Jerseys and their grades in this section. There are few factories, and most of the dairying is private or shipping milk to the city. We found a great many excellent butter makers, and we learned lessons from their experience that will be helpful to us.

The report of Mr. Sleightholm will show the extent of the work for the remainder of the season.

Whether this work will be continued or not will doubtless remain with the Honorable Minister of Agriculture to decide. On a recent visit to the county of Victoria the secretary of the institute there said that the people were anxious for the dairy another year. There are perhaps others who would wish another visit; so it seems to me that the work should be continued, with perhaps a longer stop in each place.

Report of the Travelling Dairy.

To Prof. H. H. Dean, B. S. A.

Sir,—I beg leave to present the report of the work done by the travelling dairy while it has been under my management, which time dates from June 1st to December 17th, 1894.

After a brief tutorship under yourself, I assumed full charge at Nortonville,

County of Peel,

from which place we proceeded to Hanlan, Malton, Ebenezer and Bolton, closing at the latter place the tour of that county. The meetings at these places were fairly well attended, and considerable interest was manifested in dairying throughout. At each place of meeting a lecture was given upon those topics pertaining to the making of butter on the farm, the rearing of calves, the selection and management of a dairy herd, foods, feeding of milch cows, milking, care of milk, creaming of milk, care of cream, churning of cream; washing, salting, working and packing of butter, being the chief topics discussed.

The same interest was not manifested in the work here as in some other counties we visited; due in large measure to the fact that Peel county has always been essentially a grain-producing county, the growth and sale of barley and wheat being the prime industry. Even when these commodities ceased to be so profitable as formerly, attention was directed to the raising of beef cattle for shipment to England, rather than to the dairy industry. Even yet dairying is confined chiefly to the making of butter in the private dairy, where, perhaps, six or seven cows are kept and the product sold either in the towns or villages, or taken to Toronto. In the southern part of the county, the daily delivery of milk to Toronto has reached considerable proportions. The

County of York

was next visited, and meetings were held in the following places: West Riding—Woodbridge, Weston, Islington, Thornhill and Richmond Hill; North Riding—King City, Nobleton, Schomberg, Kettleby, Yonge Street, Grange Hall, Sharon, Keswick, Sutton West, Pefferlaw, Mt. Albert, Pine Orchard, Ballantrae, Bethesda and Stouffville; East Riding—Victoria Square, Unionville, Cedar Grove, Highland Creek, Agincourt, Wexford and L'Amaroux. In all, twenty-six lectures were delivered, and twenty-six lots of cream were churned and prepared for market.

The attendance was variable throughout this county, but as a rule was not large; the average being not more than forty. One cause of the low average attendance here was, doubtless, the extreme wet weather of the month of May, which put farmers very much back with their work, and they then needed all their time to get prepared for the harvest.

It may be said of York county as of Peel, as regards the general interest taken in dairying. In the north riding, however, we had greater numbers, in some cases as many as a hundred being present. It was cause of remark that the cereal crops, the pea crop and the hay crop of this riding of York were most excellent for the season.

In the south riding we continued our meetings up to the 19th of July, after which time the work was laid aside for the harvest. Indeed, during the latter meetings the initial part of the harvest lowered the attendance considerably.

When the harvest was about housed, acting under directions from Dr. Mills, I arranged for a series of meetings in the north riding of the

County of Wentworth

as follows: Freelton, Mountsberg, Carlisle, Waterdown, Millgrove, Bullock's Corners, Rockton, Troy, Sheffield, Kirkwall and Clyde. We thus covered this section pretty well, and all who desired could attend at least one meeting and not be obliged to travel more than three or four miles.

The extreme drouth of the past summer was felt nowhere, perhaps, in Ontario more forcibly than in Wentworth county. Many of the crops were almost *nil.* The summer feeding of milch cows thus became a subject of pressing importance, and very much interest was manifested by farmers in such discussions. The

County of Brant

was our next field of work, distributed among the following places: St. George, Glenmorris, S. S. No. 11, South Dumfries, S. S. No. 13, Cainsville, S. S. No. 17, Onondaga, Newport, Mt. Pleasant, Scotland, Burford, Parley's Schoolhouse and McNaught's Schoolhouse. Owing to a failure in the appearance of the cream, and practically an empty house, no meeting was held at the last-mentioned place. At nearly all the other places the farmers turned out well, and seemed very well pleased to have a chance of discussing dairy work. As the travelling dairy had been through these counties (Wentworth and Brant) before, the people were able to speak of its usefulness as an educator on dairying, and it was a pleasing thing to hear the expressions favorable to this itinerant institution. At almost every meeting one or more voiced the thought expressed by a lady: "The character of the butter in this section has wonderfully improved since the travelling dairy was around before."

The County of Kent

was our next field of labor. In this county we visited the Town Hall (Gore), Croton, Highgate, Botany, English's Schoolhouse, Bridge End Hall, Ebert's, Richmond's Schoolhouse, Dover Centre, Mitchell's Bay, Paincourt, Crowe's Schoolhouse, Chatham Exhibition, Union Hall (Raleigh), Town Hall (Raleigh), Pardo's Schoolhouse, Merlin, Valetta, Quinn's Schoolhouse, Tilbury Centre, and Romney Town Hall. Dairying has not received very much attention in any form in this and the sister county, Essex. Nevertheless we had fairly well attended meetings as a rule. Credit is due the president and secretary of the Farmers' Institute of the two ridings of Kent for the energetic way in which they furthered the work of the travelling dairy. Here and there we met those who manifested an intense interest in the work, driving eight or ten miles or more to attend meetings.

County of Essex.

Meetings were advertised in Essex County as follows: Comber Fall Fair, Wheatley, Harrow Fall Fair, Patron Hall (Anderdon), North Ridge, Ruthven, Canard, Shuel Settlement, Hurst Settlement, Tecumseh, Ruscom and Belle River. A meeting was also advertised for Pelee Island, but as the boat did not leave the mainland until the afternoon, it was not possible for us to fill this engagement. As no preparation was made at Comber for our work on the fair ground, this also was a vacancy. With these exceptions the meetings in Essex may be considered as very successful. Much discussion was raised in these two counties upon the raising of cream by deep can setting, in comparison with the shallow pan system. The trouble experienced lies in the water of these sections, which is generally quite warm during the summer, and therefore unfit to give a good separation of cream from deep cans, and from the fact that the cellars are, in many cases, quite unsuitable for separating the cream in good condition by the shallow pan method

The conclusion generally arrived at was that a liberal supply of ice was the only satisfactory solution of the difficulty. Strange as it may seem, while these are essentially corn-growing counties, there is very little green corn or silage used to feed dairy stock. In many sections of these counties the prevalence of weeds, we think, effectually hinders the production of high-class milk, cream or butter.

Leaving Essex, we crossed Kent and commenced a very satisfactory tour of

Elgin and Norfolk.

Mahon's Schoolhouse, West Lorne, Wallacetown, Campbellton, Cowal, Iona Station, Fingal and Lawrence Station were visited in the West Riding, and the Grange Hall (Yarmouth), Mapleton, Lyons, Springfield, Summer's Corners, Orwell, Sparta, Copenhagen, Calton and Straffordville, in the east riding. From Straffordville, where one of the most successful meetings of the season was held, we entered Norfolk county, lecturing at Courtland, Delhi, Teeterville, Waterford, Bealton, Rockford, and School Section No. 4 (Townsend) in the north riding, and at the Grange Hall (Woodhouse township), Port Dover, Vittoria, Walsh, St. Williams, Clear Creek, Fair Ground, Langton and Silver Hill in the south riding, the meeting at the latter place being the closing one for the year, after a travel of over twelve hundred miles.

The farmers of Elgin and Norfolk turned out *en masse* to the meetings of the travelling dairy, and the most intense interest was manifested. The feeding of turnips to milch cows was a much debated question at many of the meetings, and strenuous differences of opinion prevailed. The usefulness or otherwise of turnip tops was also discussed. I think it correct to state that the prevailing opinion among the best farmers and dairymen was, that these foods were better left out of milch cow rations, and that green corn and ensilage, mangels, carrots and sugar beets were quite as good and without the objectionable flavor. The advisability of using the Babcock milk tester as a basis for the payment of milk delivered at cheese factories was frequently and very vigorously discussed. Generally speaking the farmers were not in favor of it, but a desire for a clearer understanding of the question was evidenced.

I find, on making a résumè of the summer's work, that there are many things to cause satisfaction to the promoters of the travelling dairy. Attention has been directed, forcefully, to the need of the closer selection of dairy stock, and to the necessity of having a standard for milk and butter production; to the need of a better system of summer feeding and management; to the basic principles underlying the handling of milk and the care of cream, that will result, as they have already resulted, in much benefit to the industry. A great many people have admired the system of working butter as practised by the travelling dairy. Many have taken the measure of the lever worker, and intend to make or buy one. The testing of several hundred samples of milk, skimmilk and buttermilk, and a consideration of the uses of the Babcock milk tester have created a keener interest in these matters. We have met with several farmers who use cream separators, and all speak well of them. But space forbids further comment. There can, however, be no room for doubt that Ontario's Minister of Agriculture has just right to feel proud of this itinerant child of his brain, the travelling dairy.

My assistant, Mr. N. J. Hume, has attended to his work in a creditable manner.

I desire, in closing this report, to recognize, with thanks, the valuable advice and assistance which I have received both from Dr. Mills and from yourself in connection with my work as lecturer and manager of the travelling dairy.

Very obediently yours,

F. J. SLEIGHTHOLM.

V. MISCELLANEOUS.

IMPROVEMENTS. In the spring, under your direction, the drives, yards and lawn about the dairy buildings were improved a great deal. Considerable grading was done so as to make the yards and drives level, while the plots in front of the buildings were seeded. New walks were laid where needed, and in the autumn a nice, wide, gravel road was made leading to and around the dairy. The yards of the piggery which had become unfit for use owing to the mire, were laid with cement and gravel. I hope that the experiment may prove successful. A neat wire fence enclosing a yard for the cows was a much needed improvement. Our improvements have kept pace with the rapid advances and needs of the dairy industry. Visitors to the south side of the Brock road will be agreeably surprised to see the change from the old piggery, ricketty sheds, and small barn, to the modern buildings and neat drives and walks of the present day. Nearly all of this has been due to your efforts and to the liberal grants of the Legislature through the efforts of the Honorable Minister of Agriculture for this purpose.

EXCURSIONS. During the summer we have had rather more than the usual number of visitors. On each day of an excursion we prepared a churning, tested milk, ran the cream separator by hand and tread power, sometimes made cheese, and endeavored by lectures and practical work to entertain and instruct visitors All seemed well pleased with our efforts, and I trust that some good was accomplished.

SPECIAL DAIRY MEETINGS. In addition to my regular work of the College, I attended meetings and gave addresses on dairy topics at the following places, besides taking charge of the travelling dairy from May 12th to June 1st as per the report under that heading: Hornby, Streetsville, Peterboro' (Eastern Dairymen's Association), Belleville (Creameries' Association), Ingersoll (Western Dairymen's Associatien), Noval, Huttonville, Dunnville, Wingham, Dungannon, Freelton, Pinedale, Greenbank, Uxbridge, Huntingdon, P. Q., (Huntingdon Dairy Association), Innerkip, Arkell, Bloomingdale, Ancaster, Brampton, Bond Head, Gormley, Listowel, Bridge End, Brantford, Peterboro', Fraserville, and Bobcaygeon.

For reports of addresses given at the dairy associations, I would refer you to their report published by the Department of Agriculture. There have been numerous requests to attend meetings in various other places, which I was unable to comply with owing to other work.

DAIRY TEST AT TORONTO. At the request of the Holstein Breeders' Association and the exhibition authorities, I took charge of the two day dairy test at the Industrial Exhibition, at Toronto, September 10th and 11th. Eleven cows entered, all Holsteins except one (a Jersey), which dropped out owing to sickness after the first day. The prizes were for the cows giving the largest number of pounds of solids in two days, to be determined by the Bobcock tester and lactometer. The first prize cow gave 130 lb. milk in two days, which tested 2.45 per cent. fat and contained 14.42 lb. solids in the two days. She was owned by Messrs. A. & G. Rice, Currie's Crossing, near Woodstock, Oxford County. The second cow was also owned by this firm and gave 98.25 lb. milk, containing 2.2 per cent. fat and 10.9 lb total solids in two days.

The third prize cow, owned by G. W. Clemons, St. George, Ont., gave 64 5 lb. milk, 3 6 per cent. fat, and 7.94 lb. total solids in the two days.

Though no fourth prize was given, yet a cow owned by the Ellis Bros., Toronto, was so near third place, I give her test—68.75 lb. milk, 2.4 per cent. fat, 7.84 lb. total solids in the two days.

The first two cows were milked three times a day—5 a.m , 12 30 p.m., and 8.30 p.m. All the cows were milked out clean the evening previous to the test; and daily composite tests were made.

TESTING APPARATUS AND DAIRY SUPPLIES. We receive a great many requests from manufacturers, agents, etc., to try various new things which are being brought before the public from time to time. So far as our time and means will permit we are willing to make these tests and give the parties the results. We have never made a practice of publishing the results, unless they are a fraud on the public, (and these seldom ask us for a test), for reasons which I need not mention. To give an idea of the things sent us on trial, I submit a partial list:

Pneumatic churn, several aerators, brands of rennet, cheese and butter color, brands of salt, milk testers, preservers of milk, foods, cow ties, udder protectors, etc.

CORRESPONDENCE. This has become quite heavy, having increased a great deal during the past two years. Letters come to the Department making inquiries about the various phases of dairy work, some of which take considerable time to answer. The writing of these together with the copying, etc., takes s considerable part of the time at my disposal while at the college.

THURSTON'S PURE MILK BUTTER PROCESS.

We have had an opportunity to see this so-called process tried recently, and have no hesitation in saying that it is a fraud on the public, unless there is something else besides the directions for manufacturing sent out with the "license."

A prominent farmer and dairyman near Guelph who tried it, also pronounces it a "fake." I repeat what was said to the farmers and dairymen of last year: "*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 Experimental Farm, or by our own farm at Guelph, which have better opportunities to test these things than the ordinary dairyman.*"

REPORT OF SPECIAL DAIRY SCHOOL COMMITTEES.

These reports have been prepared by Committees of the Special Dairy School, 1894, at the Ontario Agricultural College. They were issued as Bulletin XCIII. The committees are:

MILK-TESTING.—L. A. Zufelt, Chesterville, Ont., Instructor in Milk-Testing; T. B. Millar, London, Ont., Assistant Instructor in Cheese-Making; Wm. Campbell, Cannamore, Ont.; Miss G. E. Peacock, Mt. Salem, Ont.

SEPARATOR CREAMERIES.—M. Sprague, Ameliasburg, Ont., Instructor in Butter-Making; H. L. Beckett, B.S.A., Hamilton, Ont., Assistant Instructor Separators; J. McTavish, Seaforth, Ont., Assistant Instructor Butter-Making.

CREAM GATHERING CREAMERIES.—M. Sprague, Ameliasburg, Ont.; T. C. Rogers, O. A. C., Guelph, Instructor in Home Dairy, L. McCallum, O. A. C., Guelph.

SPRING CHEESE.—A. T. Bell, Tavistock, Ont., Instructor in Cheese-Making; J. F. Millar, Burgoyne, Ont.; S. R. Lee, Hickson, Ont.

SUMMER CHEESE.—T. B. Millar, London, Ont.; James Poole, Waba, Ont.; E. A. Bell, Crown Hill, Ont.

FALL CHEESE.—A. T. Bell, Tavistock, Ont.; W. A. Edgar, Brussels, Ont.; J. T. Hill, Napanee, Ont.

MILK-TESTING.

The term milk-testing, up to a few years ago, simply meant the detection of adulterations in milk. Now, however, it means a little more, viz., the comparative valuing of the different milks delivered, either to a cheese factory or creamery. We may, therefore, divide the work into two parts—first, the detection of adulterations in milk and second, paying for milk according to quality, or, as it is commonly called, the test plan.

Detection of Adulterations in Milk.

The most usual adulterations of milk are the addition of water and removal of cream Those factorymen who pay for milk according to quality need have no fear of either of these, as the system makes it the interest of every man to supply as rich milk as possible. but as there are many factories that still do business on the pooling system, it is thought, advisable to describe the methods by which said frauds may be detected.

The first step to be taken is to find out the specific gravity of the milk. This is done by means of the Quevenne lactometer, which has a scale corresponding to the Sp. G. (specific gravity) of milk. The graduated scale from 15 to 40 being equivalent to Sp. G. of 1.015 to 1.040; thus a milk which has a Sp. G. of 1.032 would show on the lactometer a reading of 32. These lactometers are made to give the Sp. G. at a temperature of 60° F., and as it is not always convenient to have the temperature of the milk at 60° when the reading is taken, corrections may be made for slight variations (not more than 10°) by adding to the L. (lactometer) reading .1 ($\frac{1}{10}$) for each degree of temperature above 60°, or subtracting .1 for each degree below 60°. For example, the L. reading is 29. and the temperature 68°; then the correct reading or Sp. G. for 60° would be 29 + .8 = 29.8. Had the temperature been 56°, the correct reading would be 29 – .4 = 28.6.

The average composition of milk is as follows :

Water, 87 to 88 per cent.

Fat (F.), 3.0 per cent. and upwards.

Solids not fat (S. N. F.), 8.5 to 9.5 per cent.

The Sp. G. or L. reading of pure milk ranges from 28 to 34, skimmed milk 33 to 36.

The next step to be taken is to find out the per cent. of fat. This we do by means of the Babcock tester. Then having obtained the per cent. of fat and the Sp. G., the per cent. of S. N. F. (solids not fat) may be obtained by the following formula :

$$\frac{L + F.}{4} = \text{per cent. of solids not fat.}$$

L = Lactometer reading or specific gravity at 60°.

F = Per cent. of fat.

To find the extent to which a known sample of milk has been watered, multiply the per cent. S. N. F. in the adulterated sample by 100 and divide by the per cent. S. N. F. in the pure sample. The result will be the number of pounds of pure milk in 100 pounds of the sample examined, and the remainder will be the number of pounds of water. Pure milk contains not less than 8.5 per cent. S. N. F., and often as high as 9 and 9½ per cent., and where it is not possible to get a sample of the pure milk for testing, use 8.5 as a standard for the first half of the season and gradually increase to 9 as the season advances. say beginning to use 9 the 1st of September. To make the foregoing more plain, take the following example :

L. reading 28, tem. 54°, per cent. fat 2.6, and, suppose the pure milk to test 9 per cent. S. N. F. Required to find the per cent. of water added. The correct L. reading is 28 – .6 = 27.6, then substituting for formula we get :

$$\frac{27.4 + 2.6}{4} = \frac{30.0}{4} = 7.5 \text{ per cent. S. N. F.}$$

$$\text{then } \frac{7.5 \times 100}{9 \text{ (per cent. S. N. F. in pure milk)}} = \frac{750}{9} = \left.\begin{matrix}83.3 \text{ per cent.}\\ \text{pure milk.}\end{matrix}\right\}$$

Then 100 – 83.3 = 16.6 per cent. water in the adulterated sample.

Points to be Observed.

1. Always mix milk well before taking the lact. reading. Do this in such a manner as not to make it froth or foam.
2. If it is desired to change the temperature of the milk, do so in such a way that it will be uniform throughout.
3. Always let milk stand an hour after being drawn from the cow before testing with the lactometer, as it is saturated with air and has not reached its maximum density.
4. When the L. reading is high (33 and upwards) and the per cent. of fat low (below 3 per cent.) it is an indication of skimming.
5. When the L. reading is low (below 28) and the per cent. of fat low, it indicates watering.
6. When the L. reading is normal and the per cent. of fat *very* low, it indicates both skimming and watering.

NOTES ON HANDLING THE BABCOCK TESTER.

1. See that bottles are properly graduated. This may be done by filling up to the O mark with water of the same temperature as the room, after which carefully wipe out the neck with filter paper. Then put in 2 c.c. of water with a 2 c.c. pipette, which should fill the neck up to the 10 per cent. mark. If the variation is more than .2 per cent. the bottle is not incorrect and should be discarded. Another very good way, and perhaps the most practical, is to test one quality of milk with all the bottles, and compare the readings, keeping only those bottles which give the same results.
2. Have bottles numbered.
3. Determine strength of acid. This may be done by using different quantities and thus find out which gives the best result.
4. Be sure and get a representative sample of milk in the bottle, by thoroughly mixing before measuring with the pipette.
5. Be sure and get the correct amount (17.6 c.c.) in the bottle by blowing all the milk out of the pipette into the bottle.
6. Pour in the acid so that it will run down the side of the bottle under the milk, and not directly through it, otherwise you will be likely to have charred portions of casein and milk-sugar mixed with the fat.
7. Thoroughly mix acid and milk by giving the bottles a rotary motion, seeing that no portion of the milk enters the neck of the bottle.
8. Place immediately in the machine and revolve for four minutes at the rate of from seven to twelve hundred revolutions per minute, according to the size of the machine.
9. Then add water at a temperature of not less than 130°, being careful not to fill above the 10 per cent. mark.
10. Revolve again for one or two minutes.
11. Place bottles at once in a hot water bath, after which read carefully from highest to lowest limits of fat, holding the bottle in a perpendicular position and the fat on a level with the eye.
12. Empty bottles directly after reading and rinse out twice thoroughly with hot water, using when necessary a little sal soda in the first water.
13. Always keep bottles *clean*.
14. The warmer the milk the less acid is required. and *vice versa*; consequently in the fall of the year it is advisable to warm the milk to about 70° by placing test bottles in a pan of hot water, or else use more acid.
15. Always keep bottles warm.
16. Dark, cloudy readings are caused either by using too much acid, milk at too high a temperature or acid not being properly added. If butter-fat is of a light color with particles of a curdy matter mixed with it, it indicates either not enough acid has been used, or milk has been too cold, or milk and acid have not been thoroughly mixed.
17. Be careful and exact from beginning to end if you wish to be successful.

Paying for Milk According to Quality.

This system assumes that the relative values of all milks that are pooled together for either butter or cheese, are in direct proportion to the amount of fat which each contains. The method is applied by dividing the net proceeds among the patrons in proportion to the total amount of fat which the milk supplied by each contains. To illustrate take the following example:—A., B., C., D., represent the patrons of a factory. The amount of milk which each supplied and also the quality being as follows:

A. 1,000 lb. testing........................3.7 per cent. fat.
B. 2,000 " ....3.5 "
C. 3,000 " ....3.8 "
D. 4,000 " ....4.0 "

From this milk was manufactured 1,000 lb. cheese which sold for 10c. per lb., and the cost of manufacturing being $1\frac{1}{2}$c. lb. Required to find the amount of money each should receive, the butter-fat as explained below, being worth 22.31c. per lb.

The total lb. of fat in each patron's milk is found by multiplying the number of lb. of milk by the per cent. of fat and dividing by 100, as per cent. simply means, so much in 100. The total amount of cheese made was 1,000 lb. which sold for 10c. and cost of manufacture was $1\frac{1}{2}$c.; this would leave 1,000x(10—$1\frac{1}{2}$) or 1,000x$8\frac{1}{2}$=$85.00 to be divided. Now divide this amount by the total number of pounds of fat, which is 381, and we will get the price for one pound which is $\frac{\$85.00}{381}$=22.31 cts. Then by multiplying the number of lb. of fat which each patron supplied by 22.31 cts. we will get the amount of money which each should receive.

Name of patron.	Lb. of milk.	Per cent. fat.	Total lb. fat.	Price per lb.	Amount which each should receive.
				cts.	$ c.
A	1,000	3.7	37	22.31	8 25
B	2,000	3.5	70	22.31	15 62
C	3,000	3.8	114	22.31	25 43
D	4,000	4.0	160	22.31	35 70
Total	....	....	381	....	85 00

Again, supposing the milk had been made into butter and the yield was 425 lb., which sold for 24c. and cost of manufacturing was 4c. lb. we would then have 425x20c. =$85.00 to be divided among the patrons or the price per lb. of fat would be 22.31 cts., the same as in the previous example, and the amount which each would receive would be the same as before.

The Composite Test.

As it is impossible in large factories to make a test of each patron's milk every day without a great deal of extra expense and labor, the best method to pursue is that of composite sampling. This is done by taking a sample of each patron's milk each morning, say 1 ounce, and put in a glass jar or sealer along with about 5 or 10 grains (or about what will lie on a 10-cent piece) of bichromate of potash. This quantity is sufficient to keep the milk in a perfectly liquid condition for one or two weeks, at the end of which time the test can be made in the usual way, care being taken however, to have the cream and milk thoroughly mixed before taking the sample with the pipette. The result will be the average per cent. of fat in all the milk supplied by each patron up to the time of making the test. Then to find the amount of fat which each delivered, multiply the total amount of milk sent, by the per cent. of fat and proceed as in the example given above.

In this way tests can be made once every one, two, three or four weeks with equally good results, as samples have been kept for two months and longer, which tested as well as when kept only one week, but where convenient, testing every two weeks would perhaps give better satisfaction to the patrons.

Observe Carefully the Following Points.

1. Get a fair representative sample of milk each morning.
2. Shake the sealer or jar with a rotary motion each time a new sample is put in, being careful not to churn the milk.
3. If samples are kept for three or four weeks, use a correspondingly larger quantity of the bichromate.
4. If cream should gather on the samples and become thick so as not to readily mix with the milk, before testing, stand the jars in warm water for a few minutes, shaking frequently, when the cream will quickly dissolve again.

THE SEPARATOR CREAMERY.

In the creamery, as in the private dairy, the first and most important requisite to success is cleanliness.

As it is impossible to turn out a good finished article without good material to work upon, no milk should be accepted but that of good quality and free from any objectionable odor or taint. It is important that milk should be aerated as soon as drawn from the cow, care being taken to see that the air is pure. It should also be protected from rain; rain water in milk makes it impossible to secure a good quality of butter. Milk from healthy cows only, fed on wholesome food and having access to pure water, should be accepted by the butter-maker. The pastures, yards and lanes should at all times be kept free from carrion and all decaying matter.

The milking should always be done with dry hands and in a cleanly manner, the udder being well brushed or wiped with a damp cloth. All vessels, pails, etc., should be of tin, and should be thoroughly scalded each day. Wooden pails should never be used. The butter-maker should at once reject any milk that is found to contain any bad odor, or any that is delivered in cans not properly cleaned and scalded. It is well to accompany the rejected milk with a notice as to its defect, and also, if possible, with the remedy.

After strictly enforcing the foregoing, the butter-maker should keep the factory in the best possible condition, as an example to those of his patrons who may visit him.

In order to keep the separator in good running condition, all oil must be kept wiped off, and the bearings kept free from any water, dirt or grit. Keep all parts with which the milk comes in contact thoroughly clean and well scalded every day.

The temperature of the milk to be separated should be from 80° to 85°, not allowing it to go higher, as the cost in time and ice in cooling is increased, and the quality of the product is likely to be injured.

The cream should be cooled as soon as possible after separation to about 45° or 50°, and held at that temperature until about eighteen hours before churning, then warmed to about 60°, or churning temperature. If the cream should not ripen sufficiently, add enough starter to give the cream a sharp, acid taste, and glassy appearance on the surface. About two per cent. of starter will usually be sufficient.

To prepare the starter, take fresh skim milk that is known to be free from any odor or taint and warm it to 90°, keeping it at that temperature for twenty-four hours, when it will be ready for use. It should be kept excluded from the air as much as possible, more especially if the air be at all impure. Use a small amount—about one per cent.—of the starter already made to stimulate the development of the next day's starter. This may be omitted on Saturdays, as the length of time over Sunday will give sufficient development of lactic acid, and the starter will be entirely fresh each week.

We favor cooling the cream to a low temperature immediately after separation, and ripening it in a few hours, using starter when the season and condition of the milk requires it, for the following reasons :

1. The solids in cream other than fat are subject to rapid decomposition.
2. This decomposition is not favorable to the keeping quality of whatever it affects.
3. Butter always contains a proportion of solid matter that is not fat, and the less this has advanced towards decomposition the better the flavor of the butter, and the longer will this flavor be retained.
4. This decomposition in cream is very rapid at a high temperature, while at a low temperature it is retarded.

Churning.

See that the churn is well cleaned inside, with a brush, at least once a week in cold and twice a week in hot weather, and scalded each day before and after using. Cool it before putting in the cream, which should always be strained into the churn.

Thick cream churns easier than that which is thinner ; but to get the best results it should contain from 25 to 30 per cent. butter-fat. If for any reason it should be thicker than this, it should be diluted with pure water or skim milk of the proper temperature. Churn at as low a temperature as is possible to get butter in from thirty-five to seventy minutes. To warm or cool cream, do so by putting warm or cold water or ice around the vat or vessel containing it, and stir it frequently. Never put hot water, steam or ice directly into the cream, as this tends to injure the grain of the butter, and causes in too many instances white streaks and poor flavor.

When necessary to use color, add sufficient to make the butter as nearly as possible the color of that made in June. Always add the color before starting the churn. About one-half ounce per thousand pounds of milk in winter will usually be found sufficient, gradually increasing to that amount in the fall, and lessening towards spring.

As soon as the cream breaks, or at the first signs of butter, add enough cold water to lower the contents of the churn 2° or 3°, and continue to churn until the butter granules are the size of wheat grains. Allow the churn to rest in a position to draw off the buttermilk for four or five minutes, that the particles may all arise to the top. Then draw off the buttermilk, straining it to prevent any loss of butter. Add at least as much water as there was buttermilk, at a temperature of 50° or 52° in winter, and 45°, as nearly as possible, in summer. Revolve the churn as fast as possible for about two minutes, then draw off the water, straining as in the case of the buttermilk Then add the second water—about the same quantity as for the first water—at 56° to 58° in winter and 52° to 58° in summer, and repeat as before. If for any reason the second water does not come off clear, or nearly so, repeat the washing until it does.

Allow the contents of the churn to drain well ; then take the butter out carefully, using a wooden spade, care being taken to keep it in a granular form. Weigh, and place the butter on the worker, adding salt sufficient to suit the taste of the customer. From three-fourths to one ounce of salt to one pound of butter will usually be found sufficient.

Work carefully and evenly, avoiding any rubbing or friction, until the salt is evenly distributed and excessive moisture is expelled. From seven to eight times over will usually be sufficient. Turning inwards and outwards, then doubling, is meant to be once over on the power worker. Then pack in tub. If for prints, about five or six times over will be sufficient working.

To prepare ash or spruce tubs for use, they should be pickled in hot brine for twenty-four hours or steamed over a steam jet for thirty minutes. Tin-lined tubs should be thoroughly scalded and cooled before using. Remove any resin or specks on the tin. Put the butter in the tub in small quantities, pounding it thoroughly around the edges with a suitable pounder, keeping the surface of the butter level. The tubs should be filled to within one-half an inch from the top, leaving the surface slightly crowning. Cover with parchment paper or butter cloth, or, what is better, with both. This should be covered with a salt paste, made by putting salt in cold water. The tubs should be filled until the salt is level with the top of the tub. Lining the tub with parchment paper before putting in the butter will be found to give good results.

The temperature of the storage room should not be higher than 56°, and as much lower as it can be kept uniform.

THE CREAM GATHERING CREAMERIES.

In order to attain a good reputation for our butter made in cream gathering creameries, the patrons who supply the cream should take a lively interest in supplying it sweet, clean and of pure flavor. To do this, cleanliness must be the watchword. All pails and other utensils should be thoroughly washed and then scalded, after which they should be placed outside in a pure atmosphere to become well aired. Never use a cloth for drying any of the tinware after scalding them.

The milk rooms should be kept cool, clean and with no bad odors.

Strain and set the milk immediately after milking, in water at a temperature of not more than 45 degrees in the summer and 38 to 40 degrees in the fall and winter for at least 12 hours in summer and 24 hours in winter. Every farmer who handles milk should use a thermometer, so that he may know that the milk has been cooled to the temperatures named above, as the loss of cream or butter-fat is very great when the milk has been cooled to but 50 degrees. To have profitable returns from the handling of milk for a creamery, the patrons should provide plenty of ice and have it stored in a convenient place near the milk room. The water in the tank should be changed frequently, and care should be taken to prevent any milk getting with it and allowing it to become tainted from this or any other cause. If care and good judgment is exercised much unnecessary trouble and labor can be avoided. It is not necessary to change the water more than once every second day where good, clean ice is used. Where the skim milk is not drawn off from the can at the bottom, a skimmer made 4½ inches in diameter at the top, without any wire around the edge and tapering to a point 7 inches deep, with a handle 10 to 12 inches long, will be found very convenient for skimming the cream from the top of the can. If the skim milk is drawn from the bottom of the can, a strip of glass should be soldered from the bottom upwards, so that the cream can be seen when it reaches the bottom. Tip the can a little so as to allow all the skim milk to run out without taking any of the cream. We would suggest having a bottom with three inches slant to carry off all sediment that may be at the bottom along with the first skim milk. But for general use we would recommend skimming from the top, as there will be less sediment in the cream. Where the cream has been forced up in twelve hours there will be more inches of cream than if the same milk was allowed to set for twenty-four hours, but the yield of butter will be about the same per hundred pounds of milk. Where the temperature of the milk cannot be lowered to 45 degrees, we would recommend setting the milk for 25 hours. The per cent. of butter-fat in the cream depends on the amount of skim milk in the cream. The depth or inches of cream on the top of the can depends on the per cent. of fat in the milk and the temperature to which the milk has been cooled. There will be more cream on milk containing 4 per cent. butter-fat than on milk containing 3 per cent. There will be more on milk cooled to 42 degrees than on the same milk cooled to 50 degrees.

As an educator for dairy farmers we know of nothing equal to the Babcock milk tester, which is simple and easy to operate, and would strongly recommend all dairy farmers to have, in some way, their individual cow's milk tested also the skim milk) as we know there are a large number of unprofitable cows fed and kept which should be disposed of. Each cow should give at least 6,000 lb. milk, which should make about 250 lb butter per year. The skim milk should be tested that the farmer may know whether he is getting all the cream out of the milk. We have frequently tested skim milk from farmers, showing from 1 to over 1½ per cent of butter-fat, which means a loss of about 25 per cent. of all the butter-fat in the milk, or in other words a loss of from 20 to 25 cents per hundred pounds of milk. No expensive creamer is necessary to get all the cream out of the milk, so long as you can maintain the proper temperature, as it is the temperature of the water about the milk which does the work, and not the creamer into which the cans or pails of milk are placed. Any ordinary box or barrel which is clean and will hold water, will do the work as efficiently as the most expensive creamer made.

Where shallow pan cream is taken to a creamery the milk should be set in a clean cool room at a temperature of 60 degrees and lower, for 24 hours, but no longer, as all the cream will be up in that time and of a better quality than if allowed to remain longer—as the cream being exposed to the air in warm weather becomes thick and tough and will not run through the strainer at the creamery, which means a loss to the other patrons who supply good cream. Such cream should be rejected, as it is better to lose one patron than ruin the reputation of the creamery, as it is difficult to make good flavored butter from shallow pan cream because there are very few milk rooms throughout the country which are fit to set milk in. Good flavor is the most important point about butter. Buyers look for flavor first. If the flavor is bad, down goes the price. We would recommend for creameries that all milk should be submerged in the water to protect it from any foul odors that may be about the dairy.

(Some of our best creameries refuse to take shallow pan cream at all. This, no doubt, is the safest plan.)

Where cold water or ice cannot be got we would recommend for a herd of from 15 to 20 cows a cream separator. These separators usually leave about one-tenth of one per cent. of butter-fat in the skim milk, while milk from the deep setting when cooled to only 50° usually has about one per cent. But if the same milk had been cooled to 42° or 45° the loss of fat would be but from one to three-tenths of one per cent.

Care of Cream.

After the milk has been carefully skimmed the cream should be submerged in water in a can specially made for the purpose, keeping the temperature somewhat below 50°, stirring well each time fresh cream is added. If the cream is cared for in this way there will be no complaints about sour cream, and the patron will have done his duty in supplying the butter-maker with the raw material in prime condition to make gilt edge butter. Cream should not be set in open crocks or pails in cellars, pantries or any other place where the air is not perfectly pure, nor where the temperature is above 60°, as it is sure to sour and may be in churning condition before taken to the creamery. When the cream vessel is emptied, it should be well washed and scalded, and placed where it will get plenty of fresh air. All cream vessels should have an air-tight cover, and we would recommend having the seams in all milk vessels well filled with solder, which, if not filled, an accumulation of dirt having a yellow color which will taint the milk will be seen.

The Cream Gatherer.

He should be clean, courteous, obliging and honest. He should keep the cream cans or tank thoroughly clean and in the best possible condition for the reception of the cream, and should allow the cans or tank to get all the fresh air at night possible. The wagon should be kept clean. The managers of the creamery should see that this as well as many other things of like importance are attended to.

The collector should be very careful about the measurement and mixing of the cream before the samples are taken, as carelessness on his part may cause a shortage of butter and an unjust division of the proceeds. The cream should be stirred carefully after it is poured into the measuring pail, so as to make it uniform before the sample is taken for testing. Measure carefully and give the patron credit for the full number of inches. Give a statement of all cream received from each patron and the date to the person in charge of the creamery.

The manager of the creamery should take steps to have the cream delivered at a temperature not above 60°. To do this tanks or cans should be provided with dead air spaces around the cream so as to protect it from the heat, and the wagon should be covered to protect the tank or cans from the sun. If the patrons will do as directed in the care of the cream it can be delivered much cooler than is usually done, and a superior quality of butter can be made. The cream should be strained through a perforated tin bottom strainer into the vat, also from the vat into the churn. After the cream is in the vat, take the temperature and also ascertain if it is turning sour. If the cream is sour cool at once to 56° or 58°. Sweet cream should be set at 60° to 61° over night in warm weather and from 62° to 63° in cold weather. As a rule cream is delivered through the summer at too high a temperature, and generally it is soured more or less, and it is always safe to cool down to about 56° within an hour after it is delivered into the vat and held at that temperature over night. These temperatures are given only as a guide, and the butter-maker should bear in mind that the lower the temperature the cream is ripened at, so long as the desired amount of acidity is attained, the firmer will be the texture of the butter, if the churning temperature is right. Ripening cream and churning cream at a high temperature should be avoided, as the butter will have a soft texture or body. A good supply of ice should be stored for use in warm weather to cool the cream by breaking it up fine and putting in the water around the vat. Never put ice directly into the cream in the vat or churn.

(For churning see "Separator" portion of Bulletin.)

Oil Test Churn.

1. See that representative samples are taken and that test tubes are not over half full.
2. Place in water at a temperature of 70° over night to ensure a perfect ripening of the cream.
3. Churn at a temperature of from 75° to 80°.
4. After a thorough separation of the butter, place in water at a temperature of not less than 170° for at least 20 minutes.
5. Cool again to 70° or 75°, churn and reheat, after which the readings may be taken. Readings should be made carefully and the test recorded for each patron.
6. If the separation of butter oil is not perfect, cool, churn and reheat again.

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 86° Fahr. The rennet test should then be used to ascertain the degree of ripeness. To make this test take 8 oz. milk from the vat, add to it one drachm of rennet, stir rapidly ten seconds, and if coagulation takes place in from 17 to 20 seconds the milk is sufficiently matured for the addition of the 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.

Ripen the milk to that condition that all the whey may be run off in 2½ hours after setting, and the curd showing ⅛ inch acid after dipping. Great care and watchfulness should be exercised at this season, as acid develops very rapidly during the early period of lactation.

Use sufficient rennet (from 3 to 5 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, and begin when the curd is somewhat tender. 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 period 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 ten 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 about $\frac{1}{8}$ inch of 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 to mat. When it has become sufficiently matted, cut into convenient strips (about 8 inches wide) and turn. In about ten minutes they may be turned again and piled two deep. Turn frequently (four or five times an hour) to prevent any whey 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 flaky appearance on being pulled apart and shows acid to about $\frac{3}{4}$ inch, 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 $1\frac{1}{2}$ to 2 lb. of salt per 1,000 lb. 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 press about 45 minutes, they may be taken out and neatly bandaged; only pure water should be used. They should be turned again 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 20 hours before being removed to the 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 as for spring cheese. Aeration and cleanliness should have the same careful attention. When the milk arrives at the factory each can should be subjected to strict examination by the cheese-maker (don't 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 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 $2\frac{1}{2}$ to 3 hours from the time the rennet is added, with $\frac{1}{4}$ inch 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 don't hash or slash the curd. Use the horizontal knife first, finishing with the perpendicular. When the cutting is finished, start to stir very gently at first or until the curd is somewhat firm. Do not apply heat for 10 or 15 minutes after stirring has commenced. Heat gradually up to 96° or 98°, taking fully one-half hour to do so. Continue stirring for some time after the desired temperature has been reached to prevent matting and to ensure a more uniform 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. By keeping it stirred and well aired, the flavor will be very much improved. Draw off all the whey when the curd shows $\frac{1}{8}$ inch 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 fifteen 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 $1\frac{1}{4}$ in. on the hot iron. Keep it apart and well stirred and aired after grinding until ready for salting.

In handling over-ripe milk, set at a lower temperature; use more rennet, cut finer, cook quickly, draw off part of the whey as soon as possible, dip curd with less acid, stir well before allowing to mat, grind early and mature well before 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 to 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. Use at the rate of $2\frac{1}{2}$ to $2\frac{3}{4}$ lb. of salt per 1,000 lb. milk. Hoop in from 15 to 20 minutes after the salt has been well stirred in.

Apply pressure very gently at first. After the whey begins to run clear, 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 them for the night.

Turn in the hoops in the morning, pare 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 to the curing room, which should be kept as cool as possible during the 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 each cheese with the date when made, the number of the vat it was made in, and by so doing a great many difficulties may be overcome.

FALL CHEESE.

Milk in the fall is usually sweeter and in better condition than in summer, so that the heat may be applied sooner or when it is being received into the vat; care being taken to have it stirred carefully all the while the steam is going on. Heat to 86° then apply the rennet test to ascertain the condition of milk, and if found too sweet for the application of rennet, use some clean-flavored starter. Set vats at that stage of ripeness which will ensure thorough cooking of the curd before the removal of the whey, which takes ordinarily three hours from the time the rennet is added until it is all removed and curd showing $\frac{1}{8}$ inch acid. Enough rennet should be used to cause perfect coagulation in from 40 to 45 minutes.

When ready for cutting, start by using the horizontal knife first and cut continuously until completed.

After the cutting is completed the curd should be stirred very carefully for 10 or 15 minutes before any heat is applied, then raise the temperature gradually to 98°, taking about 45 minutes to do so.

Stir the curd carefully all the while the steam is going on and for some time after the desired temperature has been reached, to prevent matting and to ensure a more uniform and thorough cooking.

Remove the whey when the curd shows $\frac{1}{8}$ inch acid. Drain well by hand, stirring before allowing to mat, and when matted sufficiently cut or break into convenient strips, and turn them over occasionally, reversing the position of the curd each time. Piling may be allowed at this stage two or three deep, but never allow any whey to gather in pools on or around the curd. If this is noticed at any time, the curd should be opened out at once and whey allowed to escape. Keep up the temperature to not less than 94° until grinding. When curd feels mellow and will pull apart in flakes or show $1\frac{1}{4}$ to $1\frac{1}{2}$ inches of acid, it should be put through the curd mill. Stir and air well immediately after milling and at intervals to keep it from matting until ready for the salt.

When the curd is well matured and has a velvety feel and a buttery appearance, the salt may be applied. Use at the rate of $2\frac{3}{4}$ to $3\frac{1}{4}$ lb. per 1,000 lb. 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 15 to 20 minutes after the salting is done. Apply the pressure very slowly at first, or until the whey begins to run somewhat clear, when all the pressure can be safely applied.

Allow the cheese to remain in the press not less than 45 minutes before taking out to dress.

See that the dressing is done neatly. Do not allow any wrinkles to remain in the bandage, but have it drawn up smoothly and laid over each end about $\frac{3}{4}$ inch. Use clean sweet cap-cloths, one on each end of the cheese, and have them laid on smoothly. Only pure, warm water should be used in bandaging.

Turn the cheese in the hoops every morning and never allow a cheese to be placed in the curing room without a perfect finish. The temperature of the curing room should be maintained as near as possible at from 60° to 65°. Cheese when taken to the curing room should be placed on the top shelves and removed to the lower ones when room is required, as by doing so there will be more uniformity in curing.

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 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 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.

A STARTER.

By A. T. Bell, Instructor in Cheese-Making, Tavistock.

A starter is some milk in which the lactic acid has been allowed to develop. In using a starter, first provide a suitable can or vessel for holding it in. A can similar to the ordinary cream gathering can will do, having double walls with hollow space between. It should have two lids, one fitting closely inside the can with a flange to keep it from going below the shoulder, and the other covering over all and fitting close to the outside.

In preparing the starter use the best cared for milk that comes to the factory—milk that has been well aired and free from any foreign flavors (it is best to use the same patron's milk). Save out say 20 lb. for each vat at a temperature of 75°, then take about one pound of the previous day's starter for every 25 or 30 lb. fresh milk saved, mix all thoroughly and allow to stand for say one hour, then add about as much water as there is milk. Stir well, cover up close and set it where it will not be disturbed until required for use.

To use, first break it up fine by stirring in the can, then take out what is required, pouring from one pail to another a few times when it will have a creamy consistency and be ready for use.

When to Use a Starter.

Be sure of the condition of the milk before adding the starter, which may be ascertained by applying the rennet test. It may be used with advantage at all times with gassy milk, and in cold weather when milk is being delivered at the factory very sweet. If it is known for a certainty that all the milk being delivered into the vat is perfectly sweet, a little may be added on the start, but the bulk should always be kept until the application of the rennet test to ascertain the condition of the milk. Do not run the rennet test so low by 3 or 4 seconds when using a starter.

While a good clean flavored starter is an advantage, a poor flavored one should never be used under any conditions, for it will spoil the flavor of the whole vat.

THE CARE OF MILK FOR CHEESE FACTORIES AND CREAMERIES.

That the cheese and butter-makers may be able to make an A1 article of cheese and butter, it is essential that they be supplied with first-class raw material. It is just as impossible for a furniture dealer to make excellent furniture out of decayed, worm-eaten lumber, or the manufacturer of "all wool" goods to make them out of shoddy, as it is for a maker to produce fancy cheese or butter from bad milk.

A cheese-maker of several years' experience said to me recently that the chief faults he found with the milk supplied in his locality were:

I. Want of Aeration.

II. Lack of Straining.

In the older cheese and butter sections these two are doubtless the points chiefly neglected.

Aeration of Milk.

Meaning. To aerate milk is to put *air into it*, hence the importance of pure air where this is done. Not only this, but aeration implies the driving off of gases that may be already in the milk. These are most easily driven off while the milk is fresh and warm, and for this reason aeration should be done *at once* after milking and *before* the milk is cooled.

Importance. The flavor of the cheese and butter largely determines the price. The flavor of these depends, with a competent maker, upon the flavor of the milk; therefore, the price depends, to a great extent, upon the flavor of the milk. This something which governs price depends upon proper management of milk at the farm. Proper aeration will get rid of any objectionable odors that may have come from the cow or food. Where paying by test is practised, aeration and stirring will prevent the cream from rising, and consequently the milk will give a higher average test and one more uniform.

How to Aerate. It may be done by dipping, pouring or stirring, or by the use of an aerator. An aerator properly used is a help, but abused it is a hindrance. Simply running milk through an aerator once after milking without any further stirring is not sufficient. It should be stirred two or three times at intervals of 10 or 15 minutes after being put through one of these aerators and again before going to bed. Not only to improve flavor should this be done, but also to prevent loss of cream in the vats, especially in the fall, when milk frequently stands some time before being set.

Some keep their milk over night in pails hanging on hooks. These hooks are fastened to a strong pole or scantling supported by means of a couple of posts in the ground.

The morning's milk needs aerating as well as the evening's.

(Note.—Attention is directed to the spelling and pronunciation of this word. In nine cases out of ten it is pronounced as if spelt erry-ation or air-y-ation, whereas it should be pronounced a-ur-ation.)

Aerators Should be Kept Clean. Look out for grease and dirt in nooks and crevices. Do not buy an aerator that is not easily cleaned. One good maker in Western Ontario does not advise the use of aerators at all, for the reason that patrons do not keep them clean.

A good thing for purifying milk may be made by taking an ordinary shallow milk pan made of strong tin. On the outside bottom of this, fasten a handle about 2½ feet long. Punch 8 or 10 small holes in the bottom of the pan. In using, put the inverted pan squarely down into the milk and allow this pan of air to bubble through the milk. When it ceases bubbling, draw out and then insert again. Do this a dozen times each evening and morning. The evening milk should be treated about three times in the foregoing manner, once immediately after milking, then in 15 minutes, and again in about half an hour. Stir before retiring for the night.

Straining.

When to Commence. Straining *should begin before commencing to milk*, by brushing off all dirt, hairs, straw, etc., from the udder, teats and body of the cow. Let it be the duty of some one person to go over all the cows with a soft brush, or a damp cloth, before the cows are milked.

How to Strain. An ordinary wire sieve strainer does very well, but we add to this by doubling cheese cloth or thin cotton so as to have four thicknesses. Lay the cloth across the bottom of the strainer and then fasten it on by means of a tin ring which slips over the cloth and bottom part of the strainer. For quickness we use a strainer that a pail of milk may be put into at once. This sits in a wooden frame over the can. Some use a woollen cloth to strain with. Cloth of some kind is necessary to catch hairs and fine dirt. This cloth must be kept clean. Scald it thoroughly each time after using.

Why Strain? Cheese and butter are articles of food to be eaten by men and women. A great many forget this. They seem to think that it does not make any difference what kind of milk is sent to the factory, judging from what may be seen on the strainers of factories. It all goes—well, goes somewhere, and they do not eat it.

Other Points to be Observed.

1. Keep none but cows that will give at least 6,000 pounds of milk or 250 pounds of butter a year. Weed out the poor ones and replenish the herd by raising calves from the best. Send milk to the factory from none but healthy animals. When a cow shows symptoms of not doing well, she should be separated from the rest of the herd and her milk not used for food.

2. Colostrum, or the first milk after calving, should not be sent to make either cheese or butter. Not until the fifth day does the milk become normal. Previous to this it contains a high percentage of albumen, which is of no use to either the cheese or the butter-maker, but is a decided hindrance.

3. In the spring and fall, while the cows are in the stable, it should be kept clean. To keep a stable clean, the following are necessary : Two brooms—a stable and a house broom ; tight floors ; land plaster for the gutter ; lime for sprinkling around the passages ; whitewash for ceilings and walls. Let the men borrow a little whitewash and a brush for an hour from the women this spring, go down to the cow stable, sweep off the cobwebs and dust that have accumulated there ever since the stable was built ; whitewash ten square feet, and then if it is thought to be a waste of lime and labor, don't do any more this spring, but observe the contrast with the rest of the stable. A cow stable is a place for a cow to *live* in, not to exist in. The health of men and women depend, to a large extent, upon the cow : the health of the cow depends largely on her house being properly aired and cleaned ; therefore the health of children and men depends in a great measure on how the cow stable is looked after. Aim to keep it as clean and pure as the house. In addition there is need of some handy method of cleaning the stable *twice* a day when the cows are in all the time, and somebody to make use of the things mentioned.

4. While in the stable, cows need currying and brushing once a day. If more time is spent in brushing the cows and less, if necessary, in brushing horses, it will pay better at present.

5. Feed nothing but pure, sweet, clean, wholesome food. Anything which gives a taint or bad flavor to milk should not be given to cows. If a taint or flavor in the milk is caused by the food, it will be at its worst when drawn from the cow ; if caused by some fermentation, it will grow worse as the milk is kept. The remedy for the latter is cleanliness. Use scalding water in washing the utensils and strainers. The following foods are prohibited in the dairy : Sour brewers' grains, distillery slops, Swede turnips and tops, rape, sour mouldy silage, musty meal, cleanings from the horse stable, and hay or grass having bad smelling weeds, such as leeks or rag-weed. Allow cows access to plenty of pure water and salt at all times.

6. Milking needs to be done by clean persons. Hands should be washed before commencing to milk. Have a wash basin, some soap, water and a towel in the stable and use them. Clean aprons to put on while milking will be useful. Milk each cow regularly and milk out clean. It will pay to " strip " the cow a minute longer than usual, if you are being paid by test.

7. After straining and aerating, the milk may be cooled for the creamery. For the cheese factory it is not necessary, except during very hot weather. The milk may as well be ripening while the maker is sleeping, as to have him sitting around waiting for it to ripen during the day.

8. Set the milk can in a place where the air is pure, and in winter where it will not freeze. Milk should be protected from sun and rain. These are good in their place, but poor things to make cheese and butter out of.

9. The milk stand should be 100 feet from the barnyard and from where pigs are fed. It should have a cover allowing a free circulation of air, at the same time preventing the milk from being heated, or allowing rain water to get into it. Rain water is said to spoil the flavor.

10. Milk wagons should be kept clean. The boxes or racks for holding the cans need scrubbing with hot water once a week to remove spilled milk, etc. This is especially necessary where whey is hauled on the same wagon as the milk. The odor of some milk wagons is sufficient to taint the milk. The horses need proper grooming that no odors from them reach the milk. The driver and his clothing should be clean and tidy. Cans of milk protected from sun and dust while on the road will reach the factory in better condition than those without cover.

11. If the can is ten years old and rusty, leaks badly, has a dinged cover, and spills one-half a gallon or more milk every day it is sent to the factory, should you continue to use it ? Will it not pay to buy a new one ?

12. Where possible, insist on the whey being returned in the milk cans. (Sour whey, alone, is an excellent article to keep pigs in good squealing condition). Let it stand in the can until just before commencing to milk, then empty, rinse very slightly with warm —not hot—water. Put the evening's milk at once into this can without straining and aerating. If it gets to the factory before it sours, step into the factory about noon and hear the cheese-maker give an exhortation on gassy curds and whey (" bucky," some call it) flavors. Observe the look on his face which says, " If I get through by 8 or 9 o'cloek to-night, I'll do pretty well." Come round again in about a month and see the buyer look at the cheese made from the vat into which but *one* can of such milk was emptied, and notice him set this cheese aside for further inspection or a lower price. He may refuse it altogether for export. It will do for the home market, and will have a great tendency to develop home consumption.

If the patron who sends milk like the foregoing suffered alone, it would not be so bad ; but if it is taken in by the maker out of pity, every patron of the factory has to bear the consequences. This is bearing one another's (useless) burdens.

13. To wash milk pails, milk cans, strainers, etc., they should be first rinsed in luke-warm water, next washed with hot water, and then be scalded, after which, put them in a nice place to air and dry. Do not wipe dairy tinware with a dish-cloth. Make a

bonfire of all the old dishcloths that are used for wiping dairy utensils and the flavor of the milk will go up 10 per cent.

14. Milk should be sent to the factory of the same quality as given by the cows. Nothing should be added to the milk and nothing taken from it (except bad odors). Removal of cream, keeping back "strippings" or skim milk, or "first milk," should be prohibited. It is as great a crime to keep home skim-milk, or the "first milk" from a cheese factory as it is to keep home cream or "strippings." Adulterated milk is milk to which anything has been added, or from which anything has been taken. Persons offering such milk for sale should be prosecuted.

15. The patrons having done everything to supply the makers with good, pure milk, it is the duty of the factoryman to make first-class goods. Patrons! step into your factory occasionally and see that everything is neat and clean in and around it, and that there is good cheese or butter on the shelves or in the store-room. If it is not so, ask why, and if the defect is not remedied, insist on a change of maker next year.

Needs of the Dairy Department.

1. A man to carry on experimental work throughout the year in the cheese department. We have made a commencement in this work, but its importance is such that we ought to have a man permanently employed. He could also give instruction to students who come here from time to time to learn something about cheese-making.

2. A man in the dairy stable and piggery to do experimental work in feeding and to assist in milking and other work as far as his time will permit. There is need for numerous experiments in the dairy stable, but as we have only one man permanently employed, he has not the time to devote to accurate experimenting.

3. A continuation of the dairy school on a smaller scale throughout the year, that students may come here at any time and receive instruction in butter and cheese-making, milk-testing, etc., while we would still continue the extra session during the winter with a full staff of instructors.

All of which is respectfully submitted.

H. H. DEAN,
Professor of Dairying.

Ontario Agricultural College,
Guelph, Dec. 31st, 1894.

PART X.

REPORT OF THE

MANAGER OF THE POULTRY DEPARTMENT.

To the President of the Ontario Agricultural College:

Sir,—By appointment of the Ontario Government, I entered upon my duties in connection with the College on the 1st October and have since been more or less engaged in assisting to get the building ready, purchasing stock, and looking after the birds now in our pens.

Buildings.

I have to express my gratification at the character of the buildings provided for the poultry department. At comparatively small cost, most excellent buildings have been constructed by the College carpenter under the direction of the President of the institution. The buildings seem to meet every requirement and are admirably adapted to our work. The ceiling of building No. 1 is seven feet high and that of No. 2 is six feet six inches.

Stock.

In compliance with your instructions, I have purchased mothing but first-class stock. At the present time we have 155 birds representing the following breeds and varieties:

1. Barred Plymouth Rocks. / White Plymouth Rocks.
2. Silver-Laced Wyandottes. / White Wyandottes. / Golden Wyandottes.
3. Light Brahmas.
4. White Cochins. / Partridge Cochins.
5. Black Langshans.
6. Black Minorcas.
7. White Dorkings.
8. Black Javas. / White Javas.
9. Black Spanish.
10. Indian Game.
11. White Leghorns.
12. Silver-Spangled Hamburgs.
13. Houdans.
14. White-Crested Black Polands.
15. Andalusians.

We propose to keep fourteen varieties in breeding pens and the additional ones in the large pen for different breeds.

The illustrations of fowls accompanying this report are photo-engraved from life.

Having got nicely started, we hope to do good work for the College and the Province.

Your obedient servant,

L. G. JARVIS,
Manager of Poultry Department.

Ontario Agricultural College,
Guelph, Dec. 31st, 1894.

REPORT OF A VISIT TO THE POULTRY DEPARTMENT.

Ontario Agricultural College.

By Thomas A. Duff, Ontario Poultry Association, Toronto.

Pursuant to many invitations, I paid a visit to Guelph on the 13th of the present month, and, of course, went out to the Agricultural College. This institution is about two miles from the centre of the city and is beautifully situated. The road leading to it was pretty well blocked with snow which made the walking very unpleasant. Although personally fond of a walk, I do not envy the superintendent of the poultry Department (Mr. L. G. Jarvis) his morning constitutional during such weather. However, he looks none the worse for it. During the summer the walk would be more pleasant. I am informed that electric cars will, in the spring, commence to run between the city and a point west of the College, so that in the near future visitors will not be required to hire a carriage or travel on foot.

I first directed my steps to the main poultry house. For some time previous to my visit I had been endeavoring to form an idea of what the place was like, but my most sanguine expectations were more than realized.

The main building (No. 1) is situated about one hundred and fifty feet from the travelled road, and is one hundred and forty feet long by fifteen feet in width, divided, however, by a storey and a half erection 20x32. The building faces the south-east, this being rendered necessary in order to conform to the road, which does not run due east and west. The house is seven feet in height at the eaves, with a third pitch roof. It is constructed as follows: After the framework was up it was boarded on the outside of the uprights with inch boards. Upon this was put tarred paper; upon this again inch boards (dressed) were placed, and then the whole was battened and nicely painted. Then on the inside of the uprights the whole building, ceiling included, was lined with tongued and grooved lumber, leaving an air space between the walls of four inches, which certainly adds to the comfort of the building. The roof is shingled, and on the inside instead of running the match boards up to the centre of the roof on the rafters, the boards run straight across making a very nice ceiling, giving the building a much better appearance and adding to the warmth. The whole sits upon a substantial stone foundation which runs quite a depth into the ground. Across the building, where each pen is divided, a stone wall runs to the level of the floor, the space between being filled in with sharp gravelly sand. This, therefore, is a sure preventative against vermin of any kind getting into the building and destroying the stock.

Upon entering, you find yourself in precisely the centre of the main building in the storey and a half erection before referred to, which is 20x30. The front part, 16x20, forms the office. This is well-lighted and fitted up with all conveniences to make work a pleasure. The back part, 14x20, is the incubator and brooder room, the intention being to run the incubators and brooder the chicks here during the extreme cold weather. and until old enough to place outside in the outdoor machines. A grass run 30 x 80 is provided immediately outside of this compartment. At the time of my visit Mr. Jarvis had in this room a Pineland incubator and brooder, the former being heated by hot air and the latter by hot water. I understand, however, that a hot water incubator will also be purchased as well as several other brooders.

Under this whole section is a splendid stone cellar, with concrete floor, in which to store fuel, vegetables, etc., the entrance to the cellar being from the incubator room.

From the office a flight of stairs leads to the upper portion of the building, which, at the time of my visit, was being fitted up as a granary and workshop.

Off the office, to the right, is a room known as the "boiler room," which is 8x10½. Here is a large caldron for boiling feed. To the left of the office is a room of the same size known as the "hospital," but at the time of my visit it was occupied by a pen of White Javas, there not being a single sick bird about the place.

Proceeding from the office in either direction I found myself in a well-lighted passage three feet six inches wide, from which a splendid view of the birds can be obtained. At each end of this house (No. 1) is a storeroom which may be used for feed and the many necessaries which should always be found about a well-regulated poultry establishment. At both ends of the building a loft has been constructed, and here may be stored coops, tools, etc. At the north-east end it is much wider than at any other part, and contains a pen for a number of birds of different breeds. The sleeping compartment is 12x13, and the scratching pen 12½x16. At the south-west end the building for male birds commences and runs parallel to the road a distance of something slightly over eighty feet. This house is about seven feet six inches high in front and slopes to about four feet at the back. It is divided into some twenty different compartments, each about 3x4, the object being that each compartment should contain an individual male bird. Duplicate male birds of all varieties will be kept in case of an accident to the bird used in the breeding pen In front along its whole length is a passageway three feet wide, thus giving the visitor ample means of viewing the stock. The building is well lighted. Each pen opens, by means of a slide, into a nice wire run, 4x6.

Between the "hospital" and the "storeroom" in building No. 1 are three pens for the fowl, each being divided into two compartments. The compartment in which they sleep is 6½x10½, with a board floor well littered with straw. The second compartment is 5½x10½ and is the fowls' "scratching pen." In this the floor is composed of sharp sand and gravel, filled in between the stone foundation hereinbefore referred to, to a depth of about eighteen inches, and here all whole grain is thrown so as to give the birds exercise by scratching for it. The sleeping compartment is separated from the "scratching pen" by a solid partition three feet in height, and above this to the roof is wire netting. A hole is cut in this partition to permit of the birds going from one pen to the other. In front, between the passageway and the pen, is a solid partition three feet high, and then wire netting to the roof which gives visitors a perfect view of the birds. Leading into each compartment from the passageway is a door similarly constructed—one door opening into the sleeping compartment and another into the "scratching pen." These doors are kept locked, which is a first-class idea as it prevents anyone not having a key going into the pens. In each sleeping compartment is a double window containing sixteen panes of glass 8x10. In each of the "scratching pens" is a door leading out into a grass run twelve feet wide and eighty feet long. The upper portion of this door has double glass windows also. It is nice to open these doors on fine sunny days as the fowls enjoy it, and it gives the building a good airing without creating a draught. When it is not desirable to open them the fowl can be let out into the yards by means of a hole cut in the building, and operated by a slide to which is attached a rope which works on pulleys, so that the person in charge can open or shut this slide from the passageway. It is very convenient. In each sleeping compartment is a box about 2x2 and nine inches deep, filled with road dust. This is placed under the window where the sun strikes it. The fowl wallow in it every day, which keeps them healthy and clean. Each pen is also provided with small boxes containing oyster shells and other gritty substances. When cabbage is fed it is hung up by the root to a height sufficient to enable the birds to reach it by jumping, thus affording them plenty of exercise. They are also provided with mangels and turnips by way of variety.

The drinking fountain used here is one which will commend itself not only to fanciers but to farmers as well. It is made of galvanized iron, square, with a place left in the top to pour the water in. It holds about three quarts. At the bottom a two-inch trough is constructed on three sides ; hole are made in these three sides of the fountain proper, out of which the water gushes into the trough, and the fountain having an air-tube inside the water can only rise to the height of these holes, so that as the fowl drink the water comes out fresh and clean. The fountain is hung on pegs just high enough for the birds to reach it conveniently. This prevents dirt getting into the water, and also keeps their combs and wattels dry, which is of great advantage during the winter months.

The nests are made as follows : Two feet four inches long, 12 inches wide, 14 high at lowest part and sloping up to a height at the back of about two feet. This prevents the birds from roosting upon them. Each nest is divided into two compartmen nd round holes cut into each to permit of the bird going in and out. At the back it is nly boarded up to a height of about six inches—just sufficient to keep the straw in. This s all that is necessary as it is placed against the wall. It is movable and easily cleaned. This makes a complete and comparatively inexpensive nest.

Feed troughs are also used for soft food. These are about three inches wide and three deep, and are hung upon nails against the partition, so that the fowl cannot get their feet into them. When they are through eating these can be placed out of the way.

One feature of the equipment of the buildings is the roosts. At the time of my visit two roosts were in use.

No. 1 was made the whole length of the pen ($10\frac{1}{2}$ feet). It is of 2x4 scantling (flat side up), placed on wooden sockets nailed to the wall and partition. Under this is a drop board, which, when down, is only three inches from the floor. In the day time, when not required for use, the roost is taken out of the sockets and the drop board turned up against the wall by means of hinges fastened to the partition. It is kept in place by hooks. On the bottom of the board are two iron brackets upon which is placed the roost. These also act as a support for the board when down.

No. 2 is known as the "Robertson roost," and, to my mind, is the most complete article I have yet seen. It is constructed as follows: Two iron uprights are screwed to the floor; about nine inches up two iron sockets are constructed. The drop board has two iron arms in the centre which fit into these sockets, and by means of a thumb-screw on one of the uprights, this drop board can be lowered for use at night or raised during the day. The roost proper is 2x4 scantling (flat side up), and in the ends are placed two iron rings. These rings slip into the uprights and hold the roost in place. President Mills asked my opinion as to the two roosts, and, without any hesitation, I cast my vote in favor of No. 2, for the following reasons:

1. Roost No. 1 is too heavy and cumbersome, and is altogether too large for the number of fowl in the pen. The dropping board sits too close to the ground, making it very difficult to clean.

2. The drop board is too long, making unnecessary work. It is too cumbersome to be often taken outside and washed. Every time it was desired to do this the hinges would have to be removed.

3. A careless attendant might easily put the roost through a window while handling it night and morning.

4. Fitting, as it does, close up to the partition, the chances are lice might become secreted in the space between drop-board and partition.

5 Roost No. 2 is neat appearing, and being almost entirely constructed of iron, is insect proof. In addition, it will last a lifetime and costs but little more than No. 1.

6. It can be made any desired size.

7. The drop-board is easily cleaned, being considerably above the floor, and if it is desired to take it outside and wash it, this can readily be done by simply lifting it out of the sockets.

8. It is only necessary to turn a thumb-screw in order to turn the dropping board up under the roost and thus keep it out of the way during the day. When required for use at night you simply have to give the screw the reverse turn.

In my opinion it is the best and most complete roost yet placed upon the market, and, I believe, will come into general use.

Water taps are placed at convenient places in both buildings.

A departure, new to the writer at any rate, has been made in the construction of the runs. Usually a solid board partition, running from the ground to a height of about two feet six inches or three feet, has been used to prevent the male birds fighting. Here, however, no boards are used, but instead, very fine wire netting has been run to a height of three feet and through this, it is thought, the birds cannot fight. It certainly makes the yards more pleasing to the eye, but whether it will answer the purpose for which it is intended remains to be seen. Gates open from each yard into the other. At the rear of these runs is a passageway or walk for visitors, from which to view the stock. This walk divides these runs from three large grass yards, 49x94, 32x94 and 36x94 respectively, it being the intention to utilize these should the smaller runs become bare of grass. The fowls could be turned into these alternately, which would give the

BLACK LANGSHAN COCKEREL

WHITE WYANDOTTE COCKEREL.

BLACK MINORCA COCKEREL.

BLACK MINORCA PULLET.


LIGHT BRAHMA PULLET.


LIGHT BRAHMA COCKEREL.

BLACK SPANISH COCKEREL.

GOLDEN WYANDOTTE COCKEREL

smaller runs a chance to improve. Fruit trees are growing in the large yards and these will provide shade. It is the intention to plant plum trees in the small runs, and I shall be interested to know the result of the experiment, as it is loudly proclaimed that plum trees do better in poultry runs than anywhere else. The yard for miscellaneous breeds is much larger than the others, being 16x154. In order to view the birds in this pen the visitor has to look through a glass window, which is not by any means as pleasant as looking through the wire. The glass gets dirty and the birds are not seen at their best.

All of the passageways and gates in the runs are wide enough to admit a wheelbarrow, so that by little labor all may be kept clean.

In line with house No. 1 is house No. 2, separated only by a carriage road. This building is constructed in precisely the same manner as No. 1, being 15x108, and six feet six inches at the eaves. In the centre is a feed room 8x10, for the storing of grain, etc., for use in this building. Beside this is a place built for a stove, which gives enough heat to warm the entire building. The balance of the house is divided into eight pens with yards—four on each side of the feed room—the same as in No. 1.

One special feature (which must be of service to the visitor, is that over each different compartment is a sign designating what the particular room is used for; also designating the variety of fowl inhabiting each pen.

The above is as accurate a description of the buildings and yards as I can prepare without the use of a plan, and, I trust, will give some little idea of what I consider, from a utility point of view, the best and most complete poultry house I have yet visited. When you bear in mind the fact that these buildings had to be constructed not only for utility, but in such a manner as to afford the public every opportunity of viewing the stock, you can realize, in part, what has been accomplished. Upon inquiring the cost of these buildings, together with the fitting up thereof, I was astonished at the small sum expended. The Government have certainly given the province good value for the amount of money expended, and have erected buildings of which the country at large may well be proud. I am satisfied the students will find this department one of the most interesting of the College course.

The erection of these buildings was looked after by President Mills personally, and too much credit cannot be given this gentleman for the part which he took in their construction. He always listened to advice, but before any changes were adopted you always had to give the why and the wherefore.

I understand it is the intention to heat house No. 1 and the cock house by steam, placing the heater in the cellar. It is not intended, however, to ever have the temperature above forty-five degrees.

Two or three small houses are to be constructed, some considerable distance from the main building, for the purpose of housing young chicks. Brooders can be placed in these, and when the chicks are old enough, these brooders can be taken out and roosts placed in the houses. They will thus answer the double purpose of brooder houses and houses for young stock after the use of the brooder becomes unnecessary.

Mr. Jarvis is a great believer in the merits of green bone, and it is the intention of the Government to procure a power machine so that large quantities of this grand food may be used.

At present the superintendent is somewhat handicapped by being obliged to live in the city. In order to properly look after poultry, and to obtain the best results therefrom, the person in charge should constantly be on hand. This is especially so during the hatching season and while the chicks are growing. I understand that it is the intention of the Government to erect a dwelling upon the farm for the use or Mr. Jarvis and his family.

I will now shortly endeavor to describe the stock, merely giving a short paragraph upon each variety kept. For the sake of convenience I will number the pens, commencing at the pen nearest the travelled road and going on through both houses, the birds being penned in the order of numbers.

No. 1. *Indian Games.* This pen is composed of one cockerel and six pullets. The cockerel is a fine big bird of good color. The pullets are all very good, the first prize bird at the last "Ontario" being among the number. I noticed two very good pullets, which are just now getting their final feathers. They were late hatched, but have nice double lacing, grand shape, and should make a pair hard to beat.

No. 2. *White Dorkings.* One cockerel and six pullets. The cockerel, to my mind, is rather small; he falls away in breast and has a very bad tail. He has, however, a very small comb, this being his chief virtue. The pullets are all very good in color, but to my mind they lack that depth of breast usually looked for in this grand variety.

No. 3. *Black Minorcas.* This yard is made up of one cockerel, four hens and five pullets. The cockerel is a very nice bird indeed, and would win at many shows; he has grand lustre and a nice comb, but a little too deeply serrated; his lobes are a little small but are nice shape and good color. The females have all good color and are of great size. Mr. Jarvis has evidently in his selection of stock, borne in mind that size is of importance in Minorcas. They are being bred too small. This is an excellent pen and should produce good stock.

No. 4. *Light Brahmas.* One cockerel and eight pullets, and a grand lot they are. The cockerel heading this pen was in the third prize breeding yard at New York show. He is of immense size, with good comb and hackle, and a nice colored tail. He has good leg and toe feather; and a beautiful bird to look at. The females are all good, Mr. Jarvis being particular to get size as well as markings. One of the pullets is inclined to be a little Cochiny in shape. Good results should come from this pen.

No. 5. *Black Javas.* Here is a grand cock bird; in fact, I do not think a better has been seen this year. His comb has been slightly frozen, but, of course, this does not hurt him. He has mated to him six excellent pullets of good size and color. One or two are a little scaly on legs.

No. 6. *White Wyandottes.* One cockerel and five pullets. The cockerel is a very large bird of good color, good comb and wattles. The females are all large, with good Wyandotte shape and exceedingly good combs.

No. 7. *Pen of Miscellaneous Breeds.* This is composed of females of breeds not kept at the College. I understand the main object is to have a few females of the different breeds, with the view to being able to give the students an object lesson during Mr. Jarvis' lectures. At the present time there are 24 birds in this pen.

No. 8. *Black Langshans.* This is a pen that any fancier might well be proud of. I question if there is a better pen in Canada at the present time. The cockerel is a typical Langshan of grand color and good comb. The eight females are all winners. Certainly Mr. Jarvis has got together a grand lot of Langshans, and he should produce some excellent stock from this mating.

No. 9. *Barred Plymouth Rocks.* One cockerel and eight females. The cockerel, to my mind, is too light in color; he has a good comb, with good colored legs and beak. The females are very good indeed. One of them is especially fine. She is well-known to fanciers, having won at the Industrial, Hamilton and the "Ontario" in 1893-94 as a pullet, and this year, first at the "Ontario" and third at New York as a hen. She is magnificently barred, and good all over. Another good bird is the first prize pullet at the last "Ontario." She is well barred all over but a little on the small side.

No. 10. *White Cochins.* One cockerel and eight females. The cockerel is a splendid bird, with good leg and toe feather. He has good Cochin shape. The females are all good, one of them being full feathered.

No. 11. *Silver Wyandottes.* This yard is made up of one cockerel and eight females. The cockerel is the best I have seen out this year. Nothing at any of our shows nor at New York could approach him. He is beautifully laced on the saddle and hackle, and has good Wyandotte shape. His comb is excellent, the spike following the neck nicely. The females are also good, two of the pullets being especially fine. They were, I understand, purchased at New Hamburg, from Mr. J. Dorst, Toronto. Some of Mr. J. E. Meyer's (Kossuth) stock is also seen here. In this pen is one very open-laced female, but she is very poor in color of tail.

No. 12. *Silver Spangled Hamburgs.* These, with the Polands, are the ladies' pets. The pen is composed of one cockerel and ten pullets of excellent quality, being made up of stock from the yards of Messrs. McNeil and Oke.

No. 13. *Black Spanish.* One cockerel, one hen and six pullets. The cockerel has a good comb, good smooth face and good color, but to my mind he lacks size. I consider he is altogether too light in body. The females are all very good indeed, with nice smooth faces. The hen is very large and good all over.

No. 14. *White Leghorns.* One cockerel and ten pullets, and all very nice indeed, with good size. The cockerel has a fair comb, nice shaped lobes, but a little too creamy in color. The pullets have nice combs and good color.

No. 15. *Houdans.* One cockerel and six pullets, and all made up of different strains. These are only a fair lot.

The above completes the number of varieties kept in No. 1 and No 2 houses, with the exception of the White Javas, but the following are at present located elsewhere.

White Crested Black Polands. These are essentially the ladies' favorites. Mr. Jarvis took special case in selecting his birds, and it is sufficient to say in regard to their quality that they are from the best stock that Messrs. McNeil and Bogue possess.

White Javas. These were located in the hospital. All are very good indeed, with nice colored legs. This should prove a very useful variety, especially as a table fowl, they being without the black pin feathers so much objected to.

Blue Andalusians. One cockerel and four hens. The cockerel is a little small, but has good color. He won 1st at Port Hope. Three of the hens are the 1st, 2nd and 3rd prize winners at Port Hope, and are as good as I have seen.

Golden Wyandottes. Mr. Jarvis has the first prize cockerel at Port Hope and three nice pullets.

At the time of my visit there were in the cock pens the following males:

Black Java cockerel, the best I have seen this year. Houdan cock, Forsyth strain, good color but very small. White Cochin cock, good bird, winner at "Ontario" last year. Black Spanish cockerel, 1st at "Ontario," good size, grand color, a little rough in face. Silver Spangled Hamburg cockerel, small, but fine comb and lobes, nice shaped spangles. Light Brahma cockerel, good all round bird, splendid comb, good color, fine tail, hackel might be a little longer, over standard weight, will make a grand cock. White Leghorn cock grand, color, good comb, nice legs. Black Langshan cockerel, 1st "Ontario," a grand bird in every way, but a little too purplish in tail.

All of the stock was purchased by Mr. Jarvis personally, and had to be first-class in every way. It certainly surprised me to know that such excellent specimens had been bought at an average of about $3 per bird. It speaks well for Mr. Jarvis' business ability.

I have visited every department of the College, and was much struck by the neatness shown everywhere. The students are a fine body of young men, and apply themselves assiduously to their studies. They are taking a lively interest in the poultry department, and no doubt this will prove one of the greatest attractions at the College. Poultry can certainly be made one of the most profitable branches of a well regulated farm, and I sincerely trust that the information obtained here will be practised at home.

Toronto, February 25th, 1895.

PART XI.

REPORT OF THE PHYSICIAN.

To the President of the Ontario Agricultural College :

Sir,—I beg to present to you my first report. My appointment as College physician was made on August 10th last.

During the present term 116 students were enrolled on the College register. They were all on admission carefully examined as required by the by-laws defining the duties of the College physician. All were found in good health and free from suspicion of contagious disease. Speaking generally, all are robust-looking young men. I found on examination, however, that a large number had never been vaccinated. This fact, in view of the occurrence of smallpox at various parts of the province, I reported to you and you required all the unvaccinated to be immediately vaccinated. This was done.

I have made the regular half-weekly, and in cases of illness, more frequent, visits required by the by-laws, as well as by the nature of the cases I have been called upon to attend. I am pleased to say that in most instances the cases of illness requiring my attention were of a mild character. The exceptions, I am happy to inform you, were few. In one of these we were obliged to remove the patient to the general hospital in the city, where I continued to attend and where he quickly recovered, and on his discharge returned to the College to resume his studies. In another instance the young man's illness was of such a nature as to compel him to return home, and for the present, at least, to give up his course in the College.

The hospital wards provided for the care of the ill are very comfortable, and the careful ministrations of the matron to the sick are worthy of praise.

Upon the good sanitary condition of the College and the general health of the institution, you are to be congratulated.

Respectfully submitted,

WM. O. STEWART,
College Physician.

Guelph, Dec. 31st, 1894.

APPENDIX I.

GRADUATES, ASSOCIATES, AND COLLEGE ROLL.

1. Graduates.

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.
1894—Brown, W. J.
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.

1883—Fee, J. J.
1894—Ferguson, J. J.
1891—Field, H.

1892—Gibson, D. Z.
1894—Graham, W. R.

1889—Harcourt, G.
1892—Harrison, F. C.
1891—Hewgill, E. A. (*ob.*)
1891—Hutt, H. L.
1889—Hutton, J. R.
1892—Hutchinson, J. W.
1894—Kennedy, P. B.

1889—Lehmann, A.
1891—Linfield, F. B.

1892—Marsh, G. F.
1890—McCallum, W.
1894—McCallum, Wm.
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.
1894—Sleightholm, F. J.
1894—Spencer, J. 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 285, 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.
1894—Buchanan, Jno.
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.
1992—Burns, J. A. S.

* Gold Medallist. † First Silver Medallist. ‡ Second Silver Medallist.

ASSOCIATES—*Continued.*

1893—Burns, J. H.

1886—Calvert, S.
1890—Campbell, C. S.
1877—Campbell, J. A.
1880—Campbell, D. P. L.
1892—Carlaw, W.
1891—Carlyle, W. L
1884—*Carpenter, P. A. (*ob.*)
1888—Carpenter, W. S.
1892—Carpenter, F. C. S.
1894—Carrick, C. S.
1886—Cobb, C.
1880—Chapman, R. K.
1882—Charlton, G. H.
1882—Chase, O.
1894—Christian, A. H.
1879—Clark, J.
1879—Clinton, N. J.
1880—Clutton, A. H.
1894—Cook, J. 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.

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.
1894—Doherty, M. W.
1890—Dolsen, W. J.
1887—Donald, G. C.
1887—Donaldson, F. N.
1877—Douglas, J. D.
1894—Duffett, G. P.
1877—Dunlop, S.
1892—Dyer, W. D.

1892—Eaton, L. W.
1890—Elliott, R.
1894—Elliott, Wm.
1893—Elmes, W. A.
1888—Elton, C. W.
1888—Elton, R. F.
1882—Elworthy, R. H.
1887—Ewing, W.

1890—Fairbairn, O. G.
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.
1888—Heacock, F. W.
1894—Henderson, R. H.
1890—Hewgill, E. A. (*ob.*)
1894—High, A. M.
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.

1894—Kennedy, W. A.
1893—Kennedy, P. B.
1894—Kidd, D. F.
1894—King, A. A.
1888—Knowlton, S. M.

1894—Lailey, F. T.
1894—Laird, J. G.
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.

* Gold Medallist. † First Silver Medallist. ‡ Second Silver Medallist.

ASSOCIATES—*Continued.*

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—Nasmith, 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. E.
1891—Perry, E. C.
1893—Phin, A. E.
1881—§Phin, R. J.
1881—Phin, W. E.
1881—Pope, H.
1886—Power, R. M.
1884—Powys, P. C.

1882—‡Ramsay, R, A.
1879—Randall, J. R.
1885—*Raynor, T.
1885—Reid, P.
1894—Reinke, C. E.
1889—Randall, W.
1889—Rennie, E. A.
1883—*Robertson, W.
1879—Robertson, J.
1894—Robertson, G. A.
1881—Robins, W. P.
1879—Robinson, C. B.
1893—Roper-Curzon, A. C. H.
1892—Roper-Curzon, S.
1881—Ross, J. G
1894—Rowe, G. F.
1892—Ruthven, W. A.

1884—Saxton, E. A.
1888—Serson, W. E.
1892—*Shaw, R. S.
1888—Sinclair, J. J.
1882—Silverthorne, N.
1894—Simpson, A. E.
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.
1894—Smyth, F. L.
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.*)

1894—Vipond, J. M.

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.
1894—*Wheatley, Jno.
1891—White, E. F.
1892—Wiancko, A. T.
1894—Widdifield, J. W.
1891—†Wilkin, F. A.
1879—Wilkinson, J. P.
1888—Willans, T. B.
1888—Willans, N.
1879—Willis, J.
1883—Willis, W. B. (*ob.*)
1888—Wilmot, A. B.
1890—Wilson, F. G.
1894—Wilson, E. E.
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 Medallist. † First Silver Medallist. ‡ Second Silver Medallist.
§ Winner of the Governor-General's Medal—the only medal given that year.

3. College Roll for 1894.

Third Year Students.

Name.	P. O. Address.	County, etc.
Burns, J. H	Kirkton	Huron, Ont.
Brown, W. J.	Dunboyne	Elgin, Ont.
Christian, A. H.	Guelph	Wellington, Ont.
Doherty, M. W.	Eglinton	York, Ont.
Ferguson, J. J	Smith's Falls	Leeds, Ont.
Graham, W. R	Belleville	Hastings, Ont.
Kennedy, W. A	Apple Hill	Glengarry, Ont.
Kennedy, P. B	Sarnia	Lambton, Ont.
King, A. A	Johnson's Crossing	Colchester Co., N. S.
Kidd, D. F	Cookstown	Simcoe, Ont.
Lailey, F. T	Toronto	York, Ont.
McCallum, Wm	Guelph	Wellington, Ont.
Robertson, G. A	Kingston	Frontenac, Ont.
Rowe, G F	London	England.
Sleightholm, F. J.	Brampton	Peel, Ont.
Spencer, J. B	Brooklin	Ontario, Ont.
White, E. F	Clarksburg	Grey, Ont.
Widdifield, J. W	Siloam	Ontario, Ont.
Wiancko, A. T.	Sparrow Lake	Muskoka, Ont.

Second Year Students.

Buchanan, John	Hensall	Huron, Ont.
Butler, W. E.	Dercham Centre	Oxford, Ont.
Caldecott, F.	Toronto	York, Ont.
Campbell, W. G	Brantford	Brant, Ont.
Carrick, C. S	Kincardine	Bruce, Ont.
Cass, L. H.	L'Orignal	Prescott, Ont.
Chadsey, G. E	Sumas	British Columbia.
Clark, J. F	Bay View	Prince Edward Island.
Cook, J. H	Gordonville	Wellington, Ont.
Duffett, G. P.	Adolphustown	Lennox, Ont.
Dunn, E.	Plover Mills	Middlesex, Ont.
Edelsten, E. J. M.	London	England.
Elford, F. C	Holmesville	Huron, Ont.
Elliott, Wm	Galt	Waterloo, Ont.
Farrer, J. W.	Parry Sound	Parry Sound District, Ont.
Fitzgerald, J. P	Mount St. Louis	Simcoe, Ont.
Graesser, F. A	Llangollen	North Wales.
Henderson, R. H.	Rockton	Wentworth, Ont.
High, A. M	Beamsville	Lincoln, Ont.
James, D. A.	Nilestown	Middlesex, Ont.
King, R. B.	Johnson's Crossing	Colchester Co., N. S.
Kipp, A.	Chilliwack	British Columbia.
Knight, J. W.	Elginburg	Frontenac, Ont.
Laird, J. G	Sarnia	Lambton, Ont.
Lang, L. W	St. Marys	Perth, Ont.
Loghrin, S. M	Stratford	Perth, Ont

3. College Roll for 1894.

Second Year Students.—Continued.

Name.	P. O. Address.	County, etc.
McCallan, E. A.	St. David's	Bermuda.
Maconachie, G. R. B.	Gurdaspur	Punjab, India.
McCullough, H. A	Nantye	Simcoe, Ont.
McDougall, D. H.	Martintown	Glengarry, Ont.
McGillivray, J. W	Sumas	British Columbia.
McKay, W. E	Prince Albert	N. W. T.
Maclennan, J. F	Hoath Head	Grey, Ont.
McPhail, J. D	Vernon	Carleton, Ont.
Macpherson, D. J.	Lancaster	Glengarry, Ont.
Paterson, T. F	Lucknow	Bruce, Ont.
Payne, G. Y.	Peterboro'	Peterboro', Ont.
Ponting, E. A	Moweaqua	Illinois, U. S. A.
Reinke, C. E.	Ancaster	Wentworth, Ont.
Rogers, C. H.	Grafton	Northumberland, Ont.
Shorey, S. C.	Harrowsmith	Addington, Ont.
Simpson, A. E.	Hamilton	Prince Edward Island.
Smith, G. A.	Morrisburg	Dundas, Ont.
Smith, P. B	Hamilton	Bermuda.
Smythe, F. L.	Tormore	York, Ont.
Taylor, W. H	Peterboro'	Peterboro', Ont.
Thom, W. E.	Morrisburg	Dundas, Ont.
Thompson, W. J	Barrie	Simcoe, Ont.
Traviss, C. H.	Holt	York, Ont.
Tye, C. W.	Haysville	Waterloo, Ont.
Vipond, J. M.	Donegal	Perth, Ont.
Wheatley, Jno.	Blackwell	Lambton, Ont.
Whetter, J. R	Lorneville	Victoria, Ont.
Wilson, E. E.	Brampton	Peel, Ont.
Wilson, N. F.	Rockland	Russell, Ont.
Wilson, A. C.	Greenway	Huron, Ont.
Wood, R. S	Walton-on-Thames	England.

First Year Students.

Allison, D. H	Adolphustown	Lennox, Ont.
Arkell, H. C.	Teeswater	Bruce, Ont.
Arms, W. L.	Randolph	Wisconsin, U. S. A.
Aylen, C. S. F.	Southsea	England.
Balfour, W. D.	Amherstburg	Essex, Ont.
Bard, A. L.	Bardsville	Muskoka, Ont.
Bell, T. C.	Cataract	Peel, Ont.
Benning, J.	Williamstown	Glengarry, Ont.
Black, G. W.	Winchester	Dundas, Ont.
Bourassa, H.	St. Hubert	Chambly Co., P. Q.
Bowker, C. G.	Bedford	England.
Brickwell, J. R.	Paris	France.
Bruneau, A. E.	Montreal	Quebec.

3. College Roll for 1894.

First Year Students—Continued.

Name.	P. O. Address.	County, etc.
Burk, H. W.	Amherstburg	Essex, Ont.
Campbell, A.	Dalmeny	Russell, Ont.
Carlyle, S. G.	Chesterville	Dundas, Ont.
Carter, W. E. C	Toronto	York, Ont.
Charlton, E. S	St. George	Brant, Ont.
Christy, E. V.	Bloomfield	Prince Edward, Ont.
Clunn, H. E.	Prestwick	England.
Clunn, W. P.	Prestwick	England.
Cousins, R. J.	Enterprise	Addington, Ont.
Cowieson, W. R.	Queensville	York, Ont.
Cunningham, J.	Ardtrea	imcoe, Ont.
DeHart, R. A	Creighton	Simcoe, Ont.
Devitt, I. I	Floradale	Waterloo, Ont.
Evans, A. R.	Newmarket	York, Ont.
Fee, F. W.	Toronto	York, Ont.
Fierheller, E.	Mt. Elgin	Oxford, Ont.
Findlay, J.	Toronto	York, Ont.
Fyfe, R.	Laurel	Dufferin, Ont.
Gadd, T.	Varney	Grey, Ont.
Gamble, Wm	Cumberland	Russell, Ont.
Gibson, T. E.	Toronto	York, Ont.
Gilbert, S	Rathgar, Dublin	Ireland.
Gillespie, C. A.	Toronto	York, Ont.
Gonin, B	Ilderton	Middlesex, Ont.
Gooch, G. E.	Toronto	York, Ont.
Guy, J. T	Columbus	Ontario, Ont.
Harkness, R. E.	Irena	Dundas, Ont.
Harris, M. E	Brantford	Brant, Ont.
Harvard, H. F.	Parkdale	York, Ont.
Higginson, O. G	Hawkesbury	Prescott, Ont.
Hodgetts, P. W.	St. Catharines	Lincoln, Ont.
Humphrey, G. F	Sussex	England.
Hutton, H.	Shanly	Grenville, Ont.
Irving, J. C	Vernon River Bridge	Prince Edward Island.
Kennedy, A.	Limehouse	Halton, Ont.
Kennedy, W. D.	Vernon	Dundas, Ont.
Kewley, H. D	Sarnia	Lambton, Ont.
Kippen, N.	Underwood	Bruce, Ont.
Leavitt, A. S.	Vankleek Hill	Prescott, Ont.
Leggatt, J.	Mitchell	Perth, Ont.
Leishman, J. E. B.	New Lowell	Simcoe, Ont.
Leonard, S. E	Woodford	Grey, Ont.
Lewis, Geo.	Ballymote	Middlesex, Ont.
Livingstone, J. M.	Sarnia	Lambton, Ont.
Logie, A. W	Montreal	Quebec.
Merritt, L. A.	St. Catharines	Lincoln, Ont.
Millichamp, R. W.	Toronto	York, Ont.
Moffatt	Morewood	Dundas, Ont.
Morgan, G. W.	Kerwood	Middlesex, Ont.

3. College Roll for 1894.

First Year Students—Continued.

Name.	P. O. Address.	County, etc.
Macdonald, A. N.	Toronto	York, Ont.
Macdonald, A.	W.Oakville	Halton, Ont.
McDonald, J. D	Lancaster	Glengarry, Ont.
McDiarmid, D. A.	Maxville	Glengarry, Ont.
McIntyre, A. W.	Newington	Stormont, Ont.
Mackay, Robt	Braemar	Oxford, Ont.
McKenzie, M. A	Thornton	Simcoe, Ont.
McKinley, W. W.	Seeley's Bay	Leeds, Omt.
McLaughlin, P. J. S.	Stroud	England.
McLaughlin, F. G.	Stroud	England.
McMillan, G. D.	Greenbank	Ontario, Ont.
Nasmith, J.	Toronto	York, Ont.
Oastler, J. R.	Featherstone	Parry Sound District, Ont.
Parker, F. A.	Bowmanville	Durham, Ont.
Pollard, J.	Orono	Ontario, Ont.
Ratcliffe, A. G.	Anderson	Perth, Ont.
Reinke, B. F.	Ancaster	Wentworth, Ont.
Rive, E.	Guelph	Wellington, Ont.
Robertson, T. H	Kingston	Frontenac, Ont.
Robertson, Geo	Ottawa	Carleton, Ont.
Robinson, H. J.	Delgany	Ireland.
Roblin, D	Adolphustown	Lennox, Ont.
Ross, M. N	Stirling	Scotland.
Ross, N. M	Stirling	Scotland.
Scott, W. F.	Milton	Halton.
Shields, W. M.	Glasgow	Scotland.
Shotwell, W. M.	Poplar Hill	Middlesex.
Silcox, C. P	Embro	Oxford, Ont.
Smith, C. F	Shirley	England.
Steele, W. D.	Toronto	York, Ont.
Stewart, A. R.	Felton	Russell, Ont.
Stoddart, R. L.	Bedford	England.
Struthers, J. B.	Underwood	Bruce, Ont.
Summerby, W. L.	Russell	Russell, Ont.
Thompson, E. D	Barrie	Simcoe, Ont.
Turnbull, W. J. E	Attwood	Perth, Ont.
Waddy, P. H	Rosseau	Parry Sound District, Ont.
Wallbridge —	Belleville	Prince Edward, Ont.
Wilken, A. G	Alford	Scotland.
Wilson, A. F.	McGarry	Lanark, Ont.
Yuill, J. J.	Carleton Place	Lanark, Ont.

Total number in general course 180

4. Dairy Students.

Name.	P. O. Address.	County, etc.
Barr, G. H	Culloden	Oxford, Ont.
Ballantyne, John	St. Marys	Perth, Ont.
Bell, E. A.	Crown Hill	Simcoe, Ont.
Bell, E. J.	Glanford Station	Wentworth, Ont.
Bell, J. W.	Newmarket	York, Ont.
Black, Miss M.	Scotch Block	Halton, Ont.
Bogart, Jno	Chesterville	Dundas, Ont.
Borland, Jno.	Villiers	Peterboro', Ont.
Brayley, C. H	Marston	Norfolk, Ont.
Briggs, Jas.	Luton	Elgin, Ont.
Brodie, G. B.	Gladstone	Middlesex, Ont.
Brown, B. C.	McLean	Addington, Ont.
Brown, S. P.	Whitby	Ontario, Ont.
Burkholder, H.	Brussels	Huron, Ont.
Calder, A. G.	Winthrop	Huron, Ont.
Campbell, Wm.	Cannamore	Stormont, Ont.
Campbell, A.	King Creek	York, Ont.
Carlyle, W. J	Dunbar	Dundas, Ont.
Chalmers, A.	Monkton	Perth, Ont.
Clark, C. A.	Brooksdale	Oxford, Ont.
Clarke, Wm.	Haliburton	Haliburton, Ont.
Coben, H	Kinmount	Victoria, Ont.
Connelly, E.	Newbury	Middlesex, Ont.
Cowie, J. G	Caledonia	Haldimand, Ont.
Crosby, J. T.	Marden	Wellington, Ont.
Crothers, H	Northrop	Prince Edward, Ont.
Cummings, J. W.	Stirling	Hastings, Ont.
Cunningham, Jno.	Ardtrea	Simcoe, Ont.
Curzon, A. R.	Guelph	Wellington, Ont.
Cuthbertson, J. J.	Bright	Oxford, Ont.
Dean, Miss E	Harley	Brant, Ont.
Dunn, E. H.	Evelyn	Middlesex, Ont.
Dwyer, Wm.	Chesterville	Dundas, Ont.
Edgar, W. A.	Brussels	Huron, Ont.
Elliott, W. J.	Remington	Hastings, Ont.
Findlay, J. H	Barrie	Simcoe, Ont.
Flack, S.	Lavender	Dufferin, Ont.
Fuller, F. L.	Truro	Nova Scotia.
Gillespie, H. W	Ida	Victoria, Ont.
Haines, H.	Arkell	Wellington, Ont.
Hamilton, C. A. W.	Guelph	Wellington, Ont.
Harris, C. O.	Tyneside	Haldimand, Ont.
Henderson, T. A.	Pitt's Ferry	Frontenac, Ont.
Herrington, A.	Russell	Russell, Ont.
Hill, J. T.	Napanee	Lennox, Ont.
Holmes, W. M.	Shanly	Grenville, Ont.
Hunter, Samuel	Rockton	Wentworth, Ont.
Hunter —	Rockton	Wentworth, Ont.
Hurstfield, Wm.	Glenallan	Wellington, Ont.
Hutchinson, Miss M.	Guelph	Wellington, Ont.
Ireland, Robt.	Beachville	Oxford, Ont.
Langstaff, S	Bishop's Mills	Grenville, Ont.

4. Dairy Students—*Continued.*

Name.	P. O. Address.	County, etc.
Lee, S. R.	Hickson	Oxford, Ont.
Lingford, H	Pickering	Ontario, Ont.
Luton, C. O	Belmont	Middlesex, Ont.
Makinson, T.	Brigus	Newfoundland.
Malcolm, John	Sheffield	Wentworth, Ont.
Michael, G. P	Hoath Head	Simcoe, Ont.
Miller, R. C.	Burlington	Halton, Ont.
Miller, John	North Bruce	Bruce, Ont.
Millichamp, R W.	Toronto	York, Ont.
Milne, R. R.	Paisley	Bruce, Ont.
Moore, John D.	Eden Mills	Wellington, Ont.
Morrison, James T	Winthrop	Huron, Ont.
Morrow, H. C	Hannon	Wentworth, Ont.
McCallum, L. C.	Guelph	Wellington, Ont.
McCullough, Miss A.	Eramosa	Wellington, Ont.
McKenzie, D. A	Donegal	Perth, Ont.
Newman, James	Princeton	Oxford, Ont.
Olmstead, W. H	Vars	Russell, Ont.
Park, A A.	Watson's Corners	Lanark, Ont.
Parr, F.	Hampton	Durham, Ont.
Pashley, Miss M. S.	Tweed	Hastings, Ont.
Peacock, Miss G. E.	Mount Salem	Elgin, Ont.
Perry, A. D.	Wilton	Lennox, Ont.
Phelps, L. L.	Mount Elgin	Oxford, Ont.
Philp, D. R.	Sparta	Elgin, Ont.
Pierson, W. J	St. Marys	Perth, Ont.
Poole, James	Waba	Renfrew, Ont.
Potter, R. J.	Mono Mills	Peel, Ont.
Price, W. W.	Butternut Ridge	New Brunswick.
Richardson, J. W.	Caledonia	Haldimand, Ont.
Robertson, L.	Guelph	Wellington, Ont.
Robeson, James	Athens	Leeds, Ont.
Rood, E. A.	Hulbert	Dundas, Ont.
Rosenbargo, Jos.	St. Marys	Perth, Ont.
Row, W. H.	Brockville	Leeds, Ont.
Saul, I. T.	Crumlin	Middlesex, Ont.
Scott, D. F.	Carleton Place	Lanark, Ont.
Smith, A.	Beachville	Oxford, Ont.
Steyn, J. G. L.	Riebeek West	Cape Colony, South Africa.
Story, J. E.	Guelph	Wellington, Ont.
Story, T. B.	Smith's Falls	Lanark, Ont.
Stratton, R. W.	Straffordville	Elgin, Ont.
Sutherland, Thomas	Grantley	Dundas, Ont.
Talbot, J. T.	Wyton	Middlesex, Ont.
Thompson, W. E.	Eldorado	Hastings, Ont.
Vanatter, P. O.	Ballinafad	Wellington, Ont.
Wallace, S. F.	Mount Forest	Wellington, Ont.
Webb, Miss F. I.	Ospringe	Wellington, Ont.
Wilford, John	Brownsville	Oxford, Ont.
Wilson, A. H.	Athens	Leeds, Ont.
Young, W. T.	Lakefield	Peterboro', Ont.

APPENDIX II.

SYLLABUS OF LECTURES.

Lectures began as usual on the 1st October, 1893, and continued, with the omission of the Christmas vacation, until the 30th June, 1894, which latter date was the end of the scholastic year 1893-94.

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 peculiarities 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 subkingdom, 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 Byron and Addison.

MATHEMATICS.

Arithmetic. Review of subject, with special reference to methods, decimals, interest, piscount, general problems.
Bookkeeping. Subject commenced.

Winter Term.—22nd January to 16th April.

AGRICULTURE.

Manures. Composition, management, and application of farmyard manure; articial 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 land 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 Longfellow.

Mathematics and Bookkeeping.

Arithmetic. Equation of payments; percentage; profit and loss; mensuration.

Bookkeeping. Business forms and correspondence; general farm accounts; dairy, 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 brough 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 Addison and Longfellow.

Mathematics.

Mensuration. Mensuration and 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.

Fruit Growing.

Introduction. Brief history of horticulture ; extent and importance of the industry ; Ontario as a fruit-growing country ; the outlook for the fruit industry ; requisites for the business.

Leading Principles in the Growth of Trees. Description and function of roots, stems, branches, buds, leaves, flowers, fruit and seeds. Illustrated by specimens in the class room.

Production of New Varieties. Species and varieties ; natural and artificial pollination ; crossing and hybridizing practised by students in the greenhouses and orchards.

Propagation of Varieties. By cuttings, layers, grafting and budding. Illustrated by specimens and practised by students in the greenhouses.

Setting Out Orchards and Fruit Plantations. Suitable soils and situations ; distances for planting ; marking out the ground ; obtaining nursery stock ; transplanting ; watering ; mulching.

General Management of Orchards and Fruit Plantations. Cultivation ; manuring ; spraying ; thinning fruit ; implements suitable for the different operations.

Different Kinds of Fruit. Apples, pears, quinces, plums, apricots, cherries, grapes, raspberries, blackberries, currants, gooseberries, strawberries, etc., treated of in detail according to the following syllabus : (1) History and botanical matter ; (2) extent of cultivation ; (3) methods of propagation ; (4) soils suitable ; (5) culture required ; (6) methods of pruning and training ; (7) time and manner of harvesting ; (8) packing and marketing ; (9) method of keeping and storing ; (10) varieties grown.

Veterinary Science.

Pathology. Osseous System. Nature, causes, symptoms and treatment of diseases of bone, as splint, spavin, ringbone, etc.

Muscular System. Nature, causes and treatment 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."

Physics.

Dynamics. Force (different kind of), motion, laws of falling bodies ; work ; the imple machines.

Winter Term—22nd January to 16th April.

Agriculture.

Sheep. Origin and history of the leading breeds of sheep in Britain and America; 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 principa 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 benefical and injurious and of insectivorous birds.

Meteorology. Relation of meteorology to agriculture; composition and movements of the atmosphere; description of the barometer; different kinds of thermometers; pluviameter and anemometer, and how to read them; temperature, its influence on agriculture; the elements which are to be considered in the discussion of climate; the principles considered in forecasting the weather.

Lectures illustrated by instruments referred to.

Horticulture.

1. *Vegetable Gardening.*

Gardening as an Occupation. Extent and importance of the industry; market ardening near large towns and cities.

The Farmer's Garden. Location, size, and soil suitable.

Fertilizers for the Garden. Barnyard manure; composts; artificial fertilizers; time and manner of applying them.

General Management of Garden. Preparation for and cultivation of crops; rotation of crops; plan of garden.

Garden Seeds. Method of obtaining; vitality; time and manner of sowing; conditions favorable to germination.

Raising Plants. Construction and management of hot beds and cold frames; transplanting.

Forcing Garden Crops. Illustrated by growth in the greenhouses of radishes, lettuce, onions, potatoes, tomatoes, cauliflowers, cucumbers, melons, rhubarb, mushrooms, etc.

Garden Crops. Beets, carrots, parsnips, salsify, radishes, turnips, potatoes, onions, asparagus, spinach, lettuce, cabbage, celery, rhubarb, cauliflower, peas, beans, corn, melons, squashes, cucumbers, tomatoes, herbs, etc., treated of in detail according to the following syllabus: (1) History and botanical matter; (2) Importance and extent of cultivation; (3) Soils and fertilizers suitable; (4) Propagation; (5) Culture and general management; (6) Harvesting; (7) Packing and marketing; (8) Storing; (9) Varieties grown.

2. *Landscape Gardening.*

Location of buildings; making and care of lawns; kinds, arrangement, and care of trees, shrubs, vines, hedges, and flower beds; course and construction of walks and drives; general surroundings.

3. Arboriculture.

Importance of forests; their effect on climate; different kinds of trees—their occurrence, habits, and uses; where trees should be planted; raising trees from seed; planting operations; transplanting large trees; care and management of trees, with a view to ornament, shelter, and economy.

4. Floriculture.

Soil for house plants; methods of potting; propagation of plants; effect of atmosphere, temperature, and light on plants; watering; trimming and training; treatment of frozen plants; resting plants; kinds of plants suitable for window or conservatory, hanging baskets, rockeries, flower beds, etc.; arrangement of plants for effect.

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 "Richard II."

Political Economy. Utility; production of wealth—land, labor, capital; division of labor; distribution of wealth; wages; trades unions; co-operation; money; credit; credit cycles; functions of government; taxation, etc.

Physics.

Statics. Theory of equilibrium; composition and resolution of forces; parallelogram of forces; centre of gravity, etc.

Hydrostatics. Transmission of pressure; the hydraulic press; specific gravity; density; pumps, siphons, etc.

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.

Determination of soils and fertilizers by physical properties.

Analytical Chemistry. Chemical manipulation, preparation of common gases and reagents; operations and analysis—solution, filtration, precipitation, evaporation, distillation, sublimation, ignition, and the use of the blow pipe; testing of substances by reagents; impurities in water; 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.

Greenhouse Plants. Special study of all plants grown in our greenhouses, and the shrubs, etc., on the lawn.

Veterinary Science.

Materia Medica. The preparation, actions, uses, and doses of 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, œsirom, 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."

Physics.

Capillarity, latent and specific heat, as affecting draining and soil cultivation.

Road-making.

Determination of proper slopes; shape of road-bed; drainage of roads; various road overings, etc.

OUTLINE OF THIRD YEAR WORK.

Agriculture.

(1) Principles and practice of general agriculture; (2) "Agriculture in some of its relations with chemistry" (Storer), Vols I. and II.; (3) Composition, use, and practical application of the more common artificial fertilizers (Canadian and United States' Experiment Station bulletins to date); (4) History, characteristics, and distinguishing points of all the pedigreed breeds of cattle, sheep and swine now bred in America; (5) The principles which govern successful stock-breeding (Miles); (6) Construction and arrangement of farm buildings, with a view to cheapness, economy of space and convenience.

Dairying.

(1) "Analysis of Foods" (Blyth), Part IV., pp. 201-238; (2) "Dairyman's Manual" (Stewart); (3) "Milch Cows and Dairy Farming" (Flint); (4) "Scientific Dairy Practice" (Lynch); (5) "The Dairy" (Long and Morton); (6) "The Practical Butter Book" (Willard); (7) Reports of Dairy Associations of Ontario for 1891 and 1892, and subsequent reports to date; (8) Eighteenth Annual Report of the Ontario Agricultural College, Part VIII, and Report for 1893, Part IX.; (9) Dairy bulletins and reports from Canadian and United States' Experiment Stations, to date; (10) "Cheddar Cheese" (Decker); (11) Course of lectures on dairying.

Chemistry.

The work in this department comes under four heads, each of which forms the basis of a separate examination.

(1) *General Chemistry, Organic and Inorganic.* "Advanced Course" and "Chemistry of the Carbon Compounds" (Remsen), with a course of lectures. Most stress laid on those elements and compounds which have a bearing on agriculture; laws and theories of chemistry discussed.

(2) *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, 10, 11 and 12; Vol. II., Chapters 5, 6, 7, 8, 9, 10, 15, 17, 18 and 19.

(3) *Animal Chemistry and Cattle Feeding.* "Manual of Cattle Feeding" (Armsby), with lectures.

(4) *Analytical Chemistry.* Qualitative and Quantitative Analysis analysis of soils fertilizers, agricultural products. etc.

Geology.

A general review of the subject, referring to ages, systems, and formations in Canada; special attention to the geology of Ontario, New Brunswick, Nova Scotia, Manitoba, and the Northwest, with reference to their most valuable economic products; the disintegration and decomposition of rocks in the formation of soil.

Natural History. (Three examinations.)

Systematic and Economic Botany. Classification of plants and characters of the most important orders; special reference to the injurious fungi and weeds.

Structural and Physiological Botany. Cells and tissues in plants; organs of vegetation and reproduction; plants in relation to soil; processes of assimilation, absorption, and metabolism.

Economic Entomology. Classification of insects; the consideration of 75 species injurious to plants and domestic animals, and the best means of killing them; beneficial insects and insectivorous birds.

Microscopy. Manipulation of the microscope; methods of mounting specimens; drawing objects under the microscope; microscopic study of plant structures.

Books of Reference in Botany, etc. Injurious Insects (Saunders); Structural Botany (Gray); Physiological Botany (Vines); Systematic Botany (Gray's Manual and Spotton, Part II.); Injurious Fungi (Smith); Practical Botany (Hillhouse); Vegetable Histology Strasburger).

English.

(1) Grammar (High School Grammar); (2) Composition and Rhetoric (Bain); (3 Outline of English Literature (Lectures with Spalding and Craik); (4) Themes; (5) Critical reading of the following selections:

Shakespeare—Macbeth.

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 in this department, it is necessary, above everything else, that the candidate know how to spell correctly and be able to write good English.

Drawing.

Freehand and mechanical drawing, especially the drawing and construction of farmhouses, barns, stables, etc.—ground plans, elevations, sections, and construction.

APPENDIX III.

EXAMINATION PAPERS.

I. Papers Set at Easter Examinations, 1894.

FIRST YEAR.

Agriculture.

I. Explain how a dairy cow differs from a cow of a beef breed.

II. What is meant by capillary power of the soil ?
Explain its importance and the conditions which influence it.

III. What is accomplished by the following operations :
(*a*) Deep plowing in autumn,
(*b*) Frequent shallow cultivation,
(*c*) Rolling ?

IV. Under what conditions might the operations mentioned in question III. prove injurious ? Give reasons.

V. Give the principal points to be observed in the care of farmyard manure.

VI. Discuss the following methods of applying farmyard manure :
(*a*) Top dressing,
(*b*) Shallow covering,
(*c*) Deep covering.

VII. In deciding the distance between laterals in draining, what things must be considered ?
Show clearly what would be the result if placed too far apart.

VIII. Under the following heads write brief notes on clover culture :
(*a*) General characteristics and importance of the crop,
(*b*) Varieties, their importance, soils to which suited,
(*c*) Cultivation, time of sowing, seed per acre, precautions to ensure crop.

IX. Discuss the following points in connection with fodder corn :
(*a*) Suitable soils,
(*b*) Place in rotation,
(*c*) Choice of varieties,
(*d*) Time and method of sowing,
(*e*) Time of cutting.

X. Suppose that on your farm there is a swampy piece of land posssessing a deep humus soil. Explain how you would proceed to reclaim it, and state what kind of crops might be grown during the first few years.

Inorganic Chemistry.

I. Distinguish between physical and chemical changes. Give examples.

II. What proportion by volume of the atmosphere is nitrogen ? Briefly describe any method to illustrate this.

III. Define combustion in its broadest sense. CO_2 is incombustible, and CO is combustible. Why ?

IV. Define the law of definite proportions. Lime mixed with a nitrogenous manure liberates seven grams of ammonia. Calculate the loss of nitrogen.

V. How are the following collected : Chlorine, hydrogen, carbonic acid (CO_2), carbon monoxide, nitric oxide, and sulphur dioxide ?

VI. Sketch an apparatus for obtaining ammonia from ammonium chloride, giving the uses of the several parts.

VII. How may common salt be made and obtained in the solid form? Give chemical equation.

VIII. Define the following: Acid salt, neutral or normal salt, metal, and base. Explain how salts are named.

IX. Name two reducing agents. What is meant by a molecular weight? Determine the molecular weight of calcium phosphate.
$Ca = 40$, $P = 31$, $O = 16$.

X. HCl is called hydrochloric acid. Why not call KCl potassium hydrochlorate? Calculate the weight of P_2O_5 in 100 lb. of monocalcic phosphate.

Geology.

I. Name the deposits wanting in Ontario and account for their absence.

II. Describe the condition of life at the close of Archaean times and draw a sketch map of North America at that time.

III. What are the striking characters of the Cretaceous system? the economic products, and where are the deposits found?

IV. Give proofs of an Ice Age in Ontario and describe briefly how it influenced the nature of our soils.

V. Name six of the most important minerals found in rocks and the constituents they supply in the formation of soil.

VI. Describe the fossils *lingula*, *trilobite*, *ammonite* and *sigillaria*, and name the deposits in which they are common.

VII. In what deposits of Ontario are the chief sources of salt, fuel and gypsum found?

VIII. Name some of the chief changes that rocks undergo after they are deposited and give diagrams showing the different kinds of valleys which sometimes result.

IX. Explain the action of the air in rock disintegration.

Zoology.

I. Give the chief characteristics of living bodies and describe briefly protoplasm and its relation to living bodies.

II. Name some of the most important forms of tapeworm, and state which is most injurious to sheep, and in what way.

III. Classify the following animals: Hawk, dog, bee, starfish, mink, sloth, trichina and whale.

IV. Compare the circulatory system in the sea urchin, tapeworm and fish.

V. State what forms the basis of classification in birds, and give a list of Canadian wild ducks and ten insectivorous birds.

VI. Explain the terms symbiosis, hybernation, metamorphosis and cryst as applied in Zoology.

VII. Compare the characters of the ungulata with those of the carnivora, and state how the animals in these orders are of economic value.

VIII. What conditions are likely to modify the distribution of animals in space?

IX. Show in what way earth worms become important in the formation of soil.

Veterinary Anatomy.

I. Describe the ligamentum nychea.

II. Name the bones of the hind extremity and describe the os calcis.

III. Describe the penniculus carnosus muscle. Give its attachments and action.

IV. What is epithelium? Name the different varieties and mention which variety is found in the air passages.

V. State the number and arrangement of temporary molar teeth a colt has at birth, and also the order and age at which he gets his permanent molars.

VI. Name the organs of respiration and describe the larynx.

VII. Name the genital organs of the male, and trace the semen from its point of secretion until it is ejected from the body.

VIII. Trace the blood through the pulmonary circulation.

IX. Give a general description of the cerebro-spinal and the sympathetic system of nerves.

X. Name the tunics of the eye and describe the lachrymal apparatus.

Literature.—Longfellow and Byron.

Ten marks will be given for *neatness, spelling* and *correctness of expression.*

Those trying for *honors* must attempt question X.

I. Discuss the metre of Evangeline.

Scan the following lines and mark the Cæsural pause :

> " Ye who believe in affection that hopes and endures and is patient,
> Ye who believe in the beauty and strength of woman's devotion,
> List to the mournful tradition still sung by the pines of the forest
> List to a tale of love in Arcadie, home of the happy.''

II. Describe (1) the appearance and (2) the character of Evangeline, quoting where you can to illustrate your answer.

III. Give in your own words or quote any of the *outdoor* scenes in Evangeline, and state in detail, with reasons, whether you consider the description true to nature.

IV. Give a synopsis of the poem "Robert of Sicily." What is the purpose of the poem?

Select any *four* of the following *six* questions :

V. Describe the death of Benedict Bellefountaine and the burning of the village. Quote where you can.

VI. Which do you consider the prettiest of the minor poems of Longfellow you have studied? *Give reasons*, and quote four consecutive stanzas from the one you select.

VII. Write out the stanza commencing

"The flying Mede, his shaftless broken bow."

or " And Ardennes waves above them her green leaves."

and point out in *detail* how the diction differs from that of prose.

VIII. Write notes on : St. John's Eve, St. Augustine, Ardennes, Lochiel, Chillon.

IX. How does Byron's " Prisoner of Chillon " differ from the historical personage? Why is this poem said to be the most un-Byronic of any he has written?

X. " This canto paints the revolt of Byron's tortured spirit against the world's opinion, to which, while he scorned it, he was to the last a slave."

Show by reference to *Byron's Life* and the III. Canto the truth of this extract giving quotations to illustrate your answer.

Grammar and Composition.

I. Define : Relative pronoun ; inflection ; subordinating conjunction ; co-ordinating conjunction ; subjunctive mood.

II. State the different methods of forming the plural of nouns, illustrating each by an example.

III. (*a*) Give the possessive singular and plural of the following nouns : Brother, ady, hero, brother-in-law, wife.

(*b*) Decline the pronous *I* and *who.*

IV. Name and classify the inflections of the pronoun and verb. (For classification see definition).

V. Analyze the following sentence an p[illegible] words :

Seeing that there was no boat, he *rie*[illegible] on a raft *made* by *fastening* together a few pieces of board.

VI. Punctuate the following sentences, giving reasons :

(a) Children imitate the language the tone the pronounciation the looks the gestures the gait of those with whom they live and if the imitation be continued sufficiently long no efforts in after life can overcome it.

(b) Nelson was in need of frigates the eyes of the fleet as he called them.

(c) 'Quick quick cried he let us run away or he will catch us
Who will catch us asked the stranger
Mr. Toil the old schoolmaster answered Daffy Dont you see him.

VII. Improve the following sentences, giving reasons for any changes :

(a) A letter received some time ago from a North-West correspondent, and which was unfortunately mislaid, appears in to-day's issue under the caption of " A settler's trials."

(b) Man, though he has a great variety of thoughts, yet they are all within his own breast.

(c) Let me awake the king of Morven, he that smiles in danger, he that is like the sun of Heaven rising in a storm.

(d) They who opulence has made proud, and who luxury has corrupted, cannot relish the simple pleasures of nature.

(e) The ends of a divine and human legislator are vastly different.

VIII. Change into prose :

All things that love the sun are out of doors ;
The sky rejoices in the morning's birth ;
The grass is bright with rain-drops ; on the moors
The hare is running races in her mirth ;
And with her feet she from the plashy earth
Raises a mist ; which, glittering in the sun
Runs with her all the way, wherever she doth run.

IX. Write a short composition on one of the fol owing :

(a) Your favorite books. (b) A description of your home.

Arithmetic and Mensuration..

I. Define trapezium, hypotenuse.

A rectangular field A B C D, whose length A B is 80 rods, and width B C 25 rods, has a straight, narrow ditch running from the corner A to the opposite side C D, ending 20 rods from the corner C. Fi d the length of the ditch and the area of the trapezium formed.

II. Find the value of a pile of lumber consisting of : 50 inch boards, 12 feet long and 10 inches wide at $11 a thousand ; 30 2 inch planks, 10 feet long and eight inches wide at $12 a thousand ; 25 pieces of scantling, three inches square and 14 feet long at $15 a thousand.

III. How many days from December 26th, 1893, to March 8th, 1894, inclusive.

Find interest on a note for $65 at six per cent for that time.

IV. (a) On April 2nd, 1894, a merchant buys $1,500 worth of goods on four months' credit, and $900 worth on two months' credit. Find the equated time for payment of the whole debt.

(b) 12 lb. of water at 40° is mixed with 3 lb. at 150°. Find the temperature of the mixture.

V. A mixture of oats and barley, 28 bushels, weighs 43 lb. per bushel. How many bushels of oats in the mixture ?

VI. Define (a) cylinder, (b) cone, (c) sphere.

How many gallons of water would a cylindrical cistern hold, whose diameter is 7 feet and depth 6 feet ? (1 cubic foot = $6\frac{1}{4}$ gallons.)

VII. If the rainfall during 24 hours is $\frac{1}{2}$ inch, how many tons of rain would fall on a 10-acre field ? (1 cubic foot of water weighs 1,000 ounces).

VIII. Multiply 3786942 by 7083005, and check your result by casting out the nines.
Prove that (1) $.72 \div .9 = .8$.
(2) $\frac{3}{4} \times 4 \cdot 5 = 3 \cdot 5$.

IX. Prove that the area of a regular polygon is equal to the length of the perpendicular from the centre of the polygon upon a side of the polygon multiplied by half of the perimeter.

From this deduce the area of a circle, giving fully each step in the reasoning.

X. A ladder whose foot rests in a given position just reaches a window on one side of a street, and when turned about its foot, it just reaches a window on the other side. If the two positions of the ladder be at right angles to each other, and the height of the windows be 36 and 27 feet respectively, find the width of the street and the length of the ladder.

Book-Keeping.

I. Define negotiable paper.
Name and define clearly three kinds of negotiable paper.

II. Give day book entries for the following:

(*a*) Merchandise, Dr	$1,000	
To pay bills		$ 700
To cash		300
(*b*) Bills, pay Dr	$1,000	
Interest, Dr	18	
To cash		1,018
(*c*) Loss and gain, Dr	150	
Cash	100	
To bills received		250

III. (*a*) Make out a list of accounts that would be opened for general business on a farm, and under these accounts classify the items of outlay and returns that would occur in general farming.

(*b*) Make out a list of, and classify, the items that you would take account of i bookkeeping for a fruit farm.

IV. I commenced business with a capital of $1,200. At the end of six months my books exhibit as follows: Cash on hand, $527.34; Henry Hicks, Dr. $495, Cr. $213; John Sims, Cr. $43; George Hope, Dr. $250, Cr. $375; goods on hand worth $755. Make out in proper form a statement showing my present worth and my net gain or loss.

V. Guelph, Ontario, April 11th, 1894.

—11—

Gave Jas. Smith, on account, my draft at ten days on L. Mason for $40.

—12—

Discounted at the bank M. Taylor's note, due 3 months hence, at six per cent. Face of note $80. Proceeds deposited.

—13—

Bought from J. Richardson goods valued at $400. Gave in payment my note at 60 days for $200, an order on H. Calder for $60, and my cheque on Merchants' Bank for balance.

(*a*) Journalize the above entries.

(*b*) Write the draft in No. 1, the note in No. 2, and the order and the cheque in No. 3.

VI. "Wanted, a foreman for a large stock farm. Applicants state experience and qualifications, with salary expected. Give references.
Answer this advertisement.

SECOND YEAR.

Live Stock.

I. In judging sheep for wool production, to what points would you pay particular attention?

II. Explain briefly in what respects the Lincoln, Leicester, and Cotswold sheep differ from each other?

III. Point out the main points of difference between Galloway and Polled Angus cattle, and between Devon and Sussex cattle.

IV. Describe the type of animal you would approve of as a beef bull, and point out the principal points in which he would differ from a dairy bull.

V. In what respects may some knowledge of the history of a breed aid us in handling it successfully? Illustrate your answer by reference to Jersey cattle.

VI. Give the leading characteristics of Holstein-Friesian and Ayrshire cattle.

VII. Describe a typical Jersey cow, and state how she differs from a Guernsey.

VIII. What is meant by an "Advanced Registry," and what is its value?

IX. State which is your favorite breed of dairy cattle, and give as many arguments as possible in its favor.

Judging Cattle.

I. Of the two steers, state which you think is the better butcher's animal, and give reasons.

II. Criticize the cow as a dairy animal, pointing out her chief good and bad habits.

III. Point out the chief defects in the Sussex bull as a beef sire.

N.B.—Marks will be allowed for the manner in which the judgment is performed.

Do not wait to be asked any questions but proceed at once to work.

Speak distinctly, least you may be misunderstood.

Judging Sheep.

I. Select which you think is the better Oxford ram, and give reasons.

II. Name the breed to which the ewe belongs, and criticize as a representative of the breed.

III. Name the breed of the ram and point out his defects.

Dairying.

I. What things are necessary to make a success of supplying milk to towns and cities? How might a better and more healthful milk supply be obtained? Mention any city where the milk is said to be very pure, and some of the measures that have been adopted to secure this.

II. How may we know whether a taint or bad flavor in milk is caused by the food eaten, or by some abnormal fermentation?

III. Why is the cream separated from milk before churning? How may it be done? Which system of creaming do you prefer? Give reasons

IV. Name the chief points to be observed in setting and starting a cream separator.

V. What is probably wrong when the following occur: (*a*) Cream is too thick; (*b*) Separation incomplete; (*c*) Machine shakes?

VI. Give the chief points of difference between the Alpha and the Danish Weston separators. In what way does the Russian differ from all the other separators in the dairy building?

VII. Define a "starter." How can it be made? Is it any advantage? If so, what?

VIII. L. reading 30; temp. 67°; fat 1.7 per cent. Give the Sp. Gr. per cent. of solids not fat, total solids, and water in the sample of milk.

IX. What is the value of 50 inches of cream testing 120 per cent. at 20 cents per standard inch.

X. Describe the "hot iron test." What "length of string" should curd have when dipped, and when milled in making spring, summer and fall cheese.

Horticulture.

I. Describe the making of a hot-bed. For what is it used ?

II. About what size would you make the vegetable garden to supply the wants of an ordinary family? What crops would you grow in it? What implements would you consider necessary in cultivating these?

III. Describe what is known as "the new onion culture." What are the advantages claimed for it?

IV. To what botanical order does the potato belong? Mention other plants belonging to the same order.

V. Tell what you know about growing asparagus.

VI. State briefly the main points to be observed in growing strawberries.

VII. How and when would you prune the raspberry?

VIII. In what way might the general appearance of country homes be greatly improved.

IX. State briefly some of the general principles to be observed in growing house plants.

X. Give the names of some of the best books in the library on fruit growing, vegetable gardening and floriculture. Name the horticultural journals in the reading-room and give a short account of any article you have read in them.

Agricultural Chemistry.

I. Name (1) the ultimate, and (2) the proximate constituents of the animal body ; and briefly discuss the composition of animals in various stages of growth and fattening.

II. Express by numbers the relative heat-producing power of the following : Cellulose, fat, starch, albuminoids, fibre and amides.

III. What is characteristic in composition of the following foods : Linseed cake, peas, oats, barley, bean straw, pasture grass, over-ripe hay and turnips?

IV. A food contains 2.064 per cent. nitrogen and 11.9 per cent. albuminoids; calculate the per cent. of amides.

V. Define "digestion co-efficient." How are digestion co-efficients determined ; and what practical value have they in feeding?

VI. What is meant by "albuminoid ratio?" Composition being Nit. substance 22.4, fat 2, S. carbohydrates 52.5, fibre 6.4, albuminoids 19.7, and digestion co-efficients respectively 77, 100, 87 and 30, determine the albuminoid ratio of the food.

VII. What is characteristic of a maintenance diet for a horse at rest? Briefly discuss the relative amount and distribution of the manurial constituents in the excrements of the animal.

Veterinary Pathology.

I. Give symptoms and treatment of open joint, and state what symptoms and conditions indicate an unfavorable termination.

II. Name the diseases of the hock and give treatment for a case of capped hock.

III. Give symptoms and treatment for sprain of back tendons (fore leg).

IV. Name the diseases of the feet and give causes and symptoms of navicular disease.

V. Name the different kinds of tumors to which the horse is subject, and give the probable cause and treatment for melanotic tumors and the effect they have on the animal in case treatment is not resorted to.

VI. Explain the difference in the symptoms of periodic and simple ophthalmia, and give causes and treatment for the latter.

VII. Give symptoms and treatment for tetanus.

VIII. Causes, symptoms and treatment for cracked heels (scratches).

IX. Give difference in the symptoms of spasmodic colic and enteritis, and give treatment for and probable termination of the latter.

X. Causes, symptoms and treatment for laryngitis.

Literature—Richard II.

I. Explain accurately the meaning of the words underlined in the following :

(*a*) thy wretched brother. . .
Who was the *model* of thy father's life.

(*b*) And fright our native peace with *self-born* arms.

(*c*) Or I'll be buried in the King's highway,
Some way of common *trade.*

(*d*) You make a *leg*, and Bolingbroke says aye.

(*e*) The *chopping* French we do not understand.

(*f*) O, how it *yearn'd* my heart when I beheld. . .

(*g*) *Depose* him in the justice of his cause.

II. By whom and under what circumstances were any *five* of the following passages uttered :

(*a*) How sour sweet music is
When time is broke, and no proportion kept !
So is it in the music of men's lives.

(*b*) I count myself in nothing else so happy
As in a soul remembering my good friends.

(*c*) They well deserve to have
That know the strong'st and surest way to get.

(*d*) The purest treasure mortal times afford
Is spotless reputation.

(*e*) Who are the violets now
That show the green lap of the new come spring ?

(*f*) O, but they say the tongues of dying men
Enforce attention like deep harmony.

(*g*) I am sworn brother, sweet,
To grim necessity.

(*h*) Within the hollow crown
That rounds the mortal temples of a king
Keeps Death his court.

III. Give an account of the 1st scene of Act I. Why does Shakespeare begin the play with this scene ?

IV. Explain fully what purposes in the play are served by the introduction of Gaunt.

V. What aspects of Richard's character are brought out respectively in the earlier scenes of the play (up to his departure for Ireland) ; in the middle scenes of the play (up to his yielding to Bolingbroke) ; and in the latter scenes ? What artistic purpose is served in bringing out the aspects of the King's character in this order ?

VI. Quote any two of the finer passages, each of about eight lines in length.

Hydrostatics.

I. What is meant by saying that matter is non-continuous ?

A block of wood is fixed to the floor, and a heavy ball is suspended so as to touch the block at one end. If the farther end is tapped with a hammer, explain what happens, and what it goes to prove.

II. Name the distinctive properties of a solid and of a gas.

One arm of a U-shaped tube passes through the stopper of a flask partly filled with water. The other arm passes into an open vessel also partly filled with water. Both ends are immersed in water. The whole set is now placed under the receiver of an air pump, and the air exhausted from the receiver, and afterwards let in again. State and explain fully the results of the experiment.

III. Define pressure, pressure at a point, and transmission of pressure.
Describe an experiment (1) to show that the pressure increases with the depth in a liquid, (2) to show the magnitude of air-pressure.

IV. Define (a) buoyancy of a liquid, (b) specific gravity.
A three inch cubic block of iron is suspended in water by a string so that the top surface of the block is 1 foot beneath the surface of the water. Draw a diagram representing the forces acting upon the block, state their magnitudes, and the conclusions to be drawn.

V. Draw a diagram of Nicholson's hydrometer and explain *in detail* its use, stating the hydrostatic principle on which it depends.
State, and explain by means of a diagram, how the specific gravity of mercury can be determined by using a U shaped glass tube.

VI. Define (*a*) cohesion, (*b*) capillarity.
Describe, by means of a diagram, the capillary tubes, and explain their action (1) when water is poured into them, (2) when mercury is poured in.
Explain what is meant by saying that mercury will not wet a body which touches it.
A small quantity of water is poured in with some mercury. Explain how the water may be removed.

VII. State the different sources from which plants may obtain moisture.
Explain, *in detail*, the method of cultivation which will bring moisture to plants, and at the same time prevent wasteful evaporation.

VIII. Draw a diagram, and explain in detail the action, of each of the following: Air-pump, siphon, Bunsen's filterer, force pump.

Political Economy.

I. Are there two kinds of Political Economy—Practical and Theoretical? If so, define and illustrate each.

II. Distinguish: Wealth, Capital, Property, Interest.
Explain: Credit, Inconvertible paper money, Bill of Exchange, Clearing House, Suspension of the Bank Act.

III. State the advantages of direct and indirect taxation, respectively.

IV. "Value always depends on supply and demand." *Explain fully.*

V. What are the functions of a bank?

VI. State the law of "Diminishing returns," and the law of "Increasing returns." In what way are these laws important in considering the following subjects: The State Management of Railways; The Nationalization of Land?

VII. The doctrine of "Laissez Faire" assumes:

(1) That all people are the best judges of their interests.

(2) That the interests of the state are always identical with those of the members.

Refute or substantiate these assumptions.

VIII. State the difficulties which arise in attempting to get a solution for what is known as "the labor problem."

IX. In Canada during the last fifteen years very many of the smaller manufactories of machinery, waggons, carriages, boots and shoes, and harness, have ceased to operate, and these articles are now made by a few large establishments.
How do you account for this change?
State and explain the economic laws which are illustrated by it.

X. Would it be advantageous for the City of Guelph through its Council to own and operate the Street Railways, Telephone System, Waterworks System, and Lighting of the City?

Drawing.

I. Draw the following plans of the Farm Piggery:

(*a*) Plan of building 100 ft. by 32 ft.
Alley through centre, from end to end, 8 ft. wide.
Doors, at each end, in the middle, 7 ft. 6 in. wide.
12 pens, each 7 ft. 2 in. wide, and 12 ft. long, on each side of the alley. Represent only partitions.
Compartment at west end, 14 ft. by 32, for feed.
Scale.—16 feet to the inch.

(*b*) Two of the pens, 12 ft. long, 7 ft. 2 in. wide.
Partition between pens, 10 ft. 9 in. long.
Small doors leading from alley, hinged at the end of partition, 1 ft. $10\frac{1}{2}$ in. wide.
Doors leading outside, 2 ft. 3 in., diagonally opposite the doors from the alley.
Pens outside, same size as inside pens.
Window 3 ft. 10 in. wide. A vertical plane through partition bisects the window.
Scale.—8 feet to the inch.

(*c*) Represent the section of the building made by the above mentioned.
Partition 3 ft. 9 in. high.
Bottom of window 4 ft. 6 in. from the floor.
Window 2 ft. 6 in. high.
Ceiling 9 ft. 4 in, from floor.
Eaves 10 ft. high. Peak of roof 21 ft.
Scale —8 feet to the inch.

II. (*a*) Draw a line parallel to a given line AB. at a given distance from it.
(*b*) Erect a perpendicular to a given line AB. from a point C. within it.
(*c*) Divide a line 4 in. long into two parts, whose ratio shall be 2 to 5.

II. Papers Set at Midsummer Examinations, 1894.

FIRST YEAR.

Agriculture.

I. Desccribe a typical mutton sheep.
II. Write brief notes on the cultivation and utility of *millet* and *rape*.
III. Give a suitable seed mixture for land that is intended for pasture.
IV. (*a*) What advantages are to be derived from following a systematic rotation?
(*b*) Give a good rotation for a clay loam farm devoted to mixed farming.
V. What general principles should be observed in keeping a farm free from weeds?
VI. Give a good method of destroying the following weeds: Canada thistles, wild mustard, and wild flax.
VII. On what soils may lime be used to advantage? Explain its action and state precautions to be observed in its use.
VIII. "But it is none the less true, that gypsum is a fit manure neither for poor land nor for regions where high farming is practised It has found place only in districts where the methods of farming were simple, and so to say backward, and is really a fertilizer of times that are past."—Storer.
Discuss the above statement.

Dairying.

I. Write a short description of a cow's udder, and tell how the milk is secreted therein. 20.

II. What points in a dairy cow indicate large milking powers and the ability to make milk of good quality? 10.

III. What characteristics are needed in a bull for dairy purposes? 10.

IV. Define the following terms: Prepotency, atavism, cross-breeding, grading, heredity, ration, and nutritive ratio. 10.

V. State how you would proceed to establish a dairy herd. 10.

VI. Given the following foods, how would you feed them and in what quantity would you feed them to a cow per day: Corn silage, clover hay, wheat bran, peas, and cottonseed meal? 15.

VII. What are the two requisites in making good silage? 10.

VIII. Give a list of soiling crops suitable for summer use, stating when and how each should be sown and the time of year it will be ready for feeding.

Bee-keeping.

I. What can you say of Canada as a field for honey production?

II. How would you begin bee-keeping?

III. Describe swarming, both natural and artificial.

IV. State methods of producing extracted and comb honey.

V. Explain process of queen-rearing.

VI. Describe approved methods of wintering bees in this climate.

Materia Medica.

I. Define Veterinary Materia Medica and state what is meant by (*a*) The Physiological and (*b*) The Therapeutic action of medicines.

II. Define and give an example of (*a*) a dieuretic, (*b*) a caustic, (*c*) an antiperiodic, (*d*) an anæsthetic.

III. Give the actions and uses of Liquor Ammoniæ Acetatis.

IV. Give actions, uses, and doses of Belladonna.

V. What is understood by a cardiac sedative? Give an example and state in what cases you would use it.

VI. Give the properties, actions, and uses of Gentian.

VII. In what cases, and why, should opium not be given?

VIII. What is (*a*) Calomel? (*b*) Corrosive Sublimate? and why is it important that these two substances should not be confounded?

IX. Give the properties, actions, uses, and doses of Chlorate of Potash.

X. Give properties and actions of the Biniodide of Mercury.

Botany.

I. Define and state how these terms are respectively applied: Napiform, epiphyte, stolen, peltate, pinnate, corymb, caducous, versatile, nectaries, fibro-vascular.

II. Distinguish between: Hybridization, Self fertilization, and Cross-fertilization.

III. Draw diagrams illustrating (1) Hypogynous, (2) Perigynous, (3) Epigynous.

IV. Give the characters of the Cruciferæ and mention weeds that occur in this order.

V. State the economic importance of the following, give scientific name, and allot to their respective orders: Watercress, flax, poppy, red clover, strawberry, sunflower, tobacco, lilac.

VI. Describe the organs of reproduction in a plant.

VII. Write a note on the collecting, preserving, and storing of plants.

VIII. Describe a cell, its forms and contents, illustrating your description by diagrams.

IX. Write a description of the Liliaceæ, naming the more important species, their habitats and times of flowering. *Tabulate your answer.*

Literature—Addison and Longfellow.

I. Explain what is meant by periodic sentence, loose sentence; and illustrate by making use of the following sentence:

Once as they sat by their evening fire, there silently entered into the little camp an Indian woman

II. Change the following into good *prose*, giving the meaning as fully as possible:

Such in the soul of man is faith. The blossoms of passion, gay and luxuriant flowers, are brighter and fuller of fragrance; but they beguile us, and lead us astray, and their odour is deadly. Only this humble plant can guide us here, and hereafter crown us with asphodel flowers, that are wet with the dews of nepenthe.

Arrange the above in verse form, and scan the two last lines.

III. Relate briefly that part of the narrative which immediately precedes, and succeeds, the following:

Suddenly, as if arrested by fear or a feeling of wonder,
Still she stood, with her colourless lips apart.

IV. State the poetic elements that characterize the poem "Evangeline," illustrating from the following, or from quotations:

"Like a phantom she came, and passed away unremembered.
Fair was she and young, when in hope began the long journey;
Faded was she and old, when in disappointment it ended.
Each succeeding year stole something away from her beauty,
Leaving behind it, broader and deeper, the gloom and the shadow.
Then there appeared and spread faint streaks of gray o'er her forehead;
Dawn of another life, that broke o'er her earthly horizon,
As in the eastern sky the first faint streaks of the morning."

V. Quote any four consecutive lines of the conclusion of "Evangeline."

VI. Write, in your best style, the substance of Addison's Essay on Discretion, or Essay on Inconstancy.

VII. Discuss the probable *purpose* and *effect* of Addison's essays, basing your remarks upon the essays you have read.

Grammar and Composition.

I. Conjugate the verbs *be* and *shall* in the present indicative and past subjunctive.

II. Show clearly, using examples, how to distinguish the imperfect participle from the infinitive in *-ing*.

III. Explain how perfect tenses are formed, and give the different uses of the verb *be*.

IV. Classify pronouns, giving an example of each.

V. Give the principal parts of the following verbs: Bleed, cast, flee, sleep, climb, beat, drink, freeze, swing, can.

VI. Analyze the following sentence and parse the underlined words: "A little room *adjoining* the *hall* is a *kind* of arsenal *filled* with guns of several sizes and inventions, *with which* the knight *has made* great havoc in the woods, *and* destroyed many *thousands* of pheasants, partridges, and *woodcocks*.

VII. Reconstruct the following, giving reasons for any changes which you make:

(*a*) I sink into the bosom of the grave, it opens to receive me, my race is run, my lamp of life is nearly extinguished.

(*b*) The annual anniversary of the landing of the pilgrims, celebrated yearly, took place a few days since.

(*c*) The following treatise, together with those that accompany it, were written many years ago.

(*d*) Alarmed by so unusual an occurrence, it was resolved to postpone their departure.

(*e*) Let you and I go together.

(*f*) Whom do men say that I am?

VIII. Write an essay of at least two paragraphs on *one* of the following topics:
- (*a*) Your favorite subject of study.
- (*b*) The value of science in agriculture.
- (*c*) A day's outing.

Arithmetic.

I. How many cords of wood in a cylindrical piece of timber 11 ft. in circumference and 40 ft. long? (128 cubic feet = 1 cord.)

II. Find total value of the following: 50 pieces of 3-inch scantling, 14 ft. long, at $13 per thousand; 60 2-inch planks, 10 in. wide and 12 ft. long, at $15 per thousand; 100 1-inch boards, 15 in. wide and 18 ft. long, at $16 per thousand.

III. How many bushels of oats must be mixed with 9 bushels of peas, in order that the mixture may average 46 lb. per bushel?

IV. Find the interest on $730 from January 10th to March 19th, 1894, inclusive, at 6 per cent. per annum.

V. How many shingles 8 in. wide, laid 4 in. to the weather, would be required for the roof of a building 30 ft. long, rafters 16 ft. long?

VI. On January 10th, Jones buys from Brown: 1 mower for $55, to be paid in 3 months; 1 rake for $32, to be paid in 2 months; find the equated time for the payment of the whole debt.

VII. Find the result, correct to four decimal places, of $4.62875 + 3.54983$.

A reaper can be bought on either of the following conditions: $110 cash or by making four equal annual payments. If money is worth 6 per cent., and the first payment is made at the time of purchase, find what should be the amount of each payment. Test the accuracy of your result.

VIII. A dealer sold an article at a gain of 35 per cent. If it had cost him $16 more, the same selling price would have yielded a gain of $12\frac{1}{2}$ per cent. Find the cost of the article.

IX. A farmer sold two loads of wheat, in all 110 bushels, for $94.95; one load realized 97c. a bushel and the other 72c. How many bushels were there in each load?

X. Divide 710 by 26 in the scale of 9.

SECOND YEAR.

Agriculture.

I. Explain the importance of heredity in stock breeding.

II. Write notes on in-breeding, discussing its utility, and pointing out its advantages and dangers.

III. What constitutes a good pedigree? Of what importance is a pedigree?

IV. Describe the type of sow which you think might be most successfully mated with the Tamworth boar used on this farm.

V. Write notes on the history and general characters of Berkshire and Poland China swine.

VI. State the main points of difference between improved Yorkshire and Chester White hogs.

VII. Outline your plan regarding the following:
- (*a*) Summer management of cows that are milking.
- (*b*) Management of brood sow from time of service until young pigs are one week old.
- (*c*) Management of lambs from the time they are dropped until one week after they are weaned.
- (*d*) Management of stock bull from the time he is one year old.

Dairying.

I. "Rennet action as to time depends upon four things." What are they? 10

II. Hansen's Rennet Extract coagulated 8 ounces of milk in 20 seconds at a temperature of 86°, while a sample sent to the Dairy for testing coagulated the same quantity of milk at the same temperature in 24 seconds. Which is the stronger rennet? How much stronger is one than the other? 10.

III. Give the leading features of the Cheddar system of cheese-making. 10.

IV. Why is the curd cut into cubes? How is it done? What points need to be observed in cutting? 20.

V. When is a curd ready to salt? How much salt should be used? What are the general effects of salt, and the effects of using too much? Under what conditions may an extra amount of salt be used and why? 20.

VI. Give a scale of points for judging cheese. What is the most important point in a good Cheddar cheese? How may it be spoiled? 20.

VII. What two plans of conducting the factory business are usually adopted in Ontario? Name the advantages and disadvantages of each.

Agricultural Chemistry.

I. Enumerate the bad effects of excessive water in soil.

II. Name the essential elements found in the ash of plants.

III. Discuss the use of common salt on land.

IV. Determine the pounds of nitrogen applied in sowing per acre 200 lb. of ammonium sulphate, 94 per cent. pure.

V. Define the following: Albuminoid ratio, proteids, amides, digestion, co-efficients, and non-albuminoids.

VI. Name the most suitable manures for the following crops: Turnips, mangels, spring wheat, barley and clover.

VII. What observations have you made as to the effects of four fertilizers and in fertilizer with oats growing in experimental plots?

Analytical Chemistrry.

I. Is iron present in substance A?

II. Three salts are marked respectively I, II and III. Determine which is potassium sulphate and which sodium nitrate.

III. Does substance D contain phosphoric acid?

IV. Determine the groups present in mixture E.

Botany.

I. Give the characters of the *Borraginaceæ* and *Umbellifera*, mentioning some of the common plants in each.

II. Describe a seed, and state how it differs from a spore.

III. Name some orders in which the plants are monœcious or diœcious.

IV. Give a list of weeds with creeping perennial roots, and name the orders to which they belong.

V. Represent a typical cell and mention some of the modifications which cells undergo during development.

VI. Compare the downy mildew and the powdery mildew of the grape, and describe carefully the preparation of the Bordeaux mixture.

VII. Distinguish between Angiospermous and Gymnospermous plants.

VIII. Indicate the *plan* and *formula* of the flower before you. To what order does it belong?

Horticulture.

I. Tell what you know about the nature and functions of roots.
II. Give briefly the management of a young orchard.
III. Describe what you consider the best plan of laying out an orchard,
IV. How would you distinguish a leaf bud from a fruit-bud?
V. What is meant by thinning fruit? Why is it practised?
VI. At what stage of maturity would you pick apples, pears, plums, and grapes? How is the proper stage of maturity in these fruits indicated?
VII. What are the main points to be observed in storing fruits for winter use?
VIII. How are new varieties of fruits originated? By what means may they be perpetuated?
IX. State the objects of top grafting and tell how it is done.
X. Describe the Kniffen system of pruning grapes.

Veterinary Obstetrics.

I. State what is understood by the term Veterinary Obstetrics, and name the four great functions of the generative system.
II. Give the symptoms of threatened abortion, and the treatment to prevent the accident.
III. In case of difficult parturition due to non-dilation of the os uteri, how would you proceed to deliver?
IV. Give symptoms and treatment (in detail) of inversion of the uterus in the cow.
V. Give the advisable general treatment of mare and offspring after a normal parturition.
VI. Give symptoms and treatment (both preventive and curative) of parturient appoplexy in the cow.
VII. Give causes, symptoms, and treatment of parturient laminitis in the mare.
VIII. Give symptoms and treatment of indigestion in calves.
IX. State what is understood (*a*) by the law of Similarity, (*b*) by the law of Atavism, and give an illustration of the latter.
X. In what way is the future progeny of a female influenced by the first impregnation?

Literature—L'Allegro and Il Penseroso.

I. Quote and compare L'Allegro's life set to music.
and Il Penseroso's life set to music.

II. Show by reference to the poems that
(*a*) L'Allegro is a reflection of the Cavalier character
and (*b*) Il Penseroso is a reflection of the Puritan character.
Which more truly reflects Milton's own disposition? Give reasons.
III. What is alliteration? Quote examples from these poems.
IV. Explain the force of the following epithets:
Momumental oak, *heart-easing* mirth, *vain deluding* joys, *ivy-crowned* Bacchus.
Give the derivation of cynosure, twilight, junket.
V. "Half-regained Eurydice." Relate the story, and write brief notes on Prince Memnon, Euphrosyne, Cambuscan.
VI. Justify the following criticisms:
i. "Never was voice given more sweetly to the echo which the loveliness of inanimate nature awakens in the poetic heart."
ii. "Milton is not a man of fields, but of books."
iii. "Milton's defective sight and studious habits have made his pictures in some instances untrue to nature."

VII. Any one of the following three :

(*a*) Quote the introductions of the two poems ; which do you consider the better ? Give *reasons* for your preference

(*b*) Write out your favorite passage (about 20 lines.) Give *reasons* for your selection.

(*c*) State fully in chronological order, with dates, the principal events of Milton's life.

English Grammar.

I. Analyze and parse the following sentence :

Whatever is worth doing at all is worth doing well.

II. Explain and illustrate what is meant by a *predicate adjective*, an *adverbial predieate adjective*, and an *objective predicate adjective.*

III. Give and explain by an example the rule regarding the case of a *predicate pronoun.*

IV. Under what circumstances may an intransitive verb be used transitively? Illustrate by examples, using the verb *run.*

V. How is the passive voice of verbs formed, and what is gained by the use of it in English?

VI. Write out the *simple* or *predictive* future of the verb *strike* ; also the *promissive* future and the interrogative form.

VII. State the different ways of indicating possession in English. Give one example of each, and point out restrictions or limitations in the use of the Saxon possessive.

VIII. Give conditions as to the use of participles.

IX. Make such changes as you think necessary in the following sentences, and give reasons for what you do :

(1) He should reserve the honor for you or I.
(2) Whom do you think it was ?
(3) I rely on you coming.
(4) What is this cheese's weight ?
(5) Every man, woman, and child were put to the sword.
(6) I wish them boys would be quiet.
(7) I fear I will be under the necessity of reporting him.
(8) Will I put Hill in room No. 4.
(9) Hoping to hear from you soon, believe me yours truly.

Hydrostatics and Road-Making.

I. Define *Heat*, and state the various effects of applying heat to water.

Describe an experiment showing the effect of heat on a gas.

II. Define caloric, latent heat of evaporation. Describe fully an experiment whereby the latent heat of evaporation of water may be determined, using the following data : 1,000 grams water at 20° C., raised to 55° C. by 52 grams steam.

Point out the bearing of this question of latent heat on that of draining.

III. Explain fully the meaning of "The Latent Heat of Fusion of Ice is 79."

If 100 grams at 60° is poured upon 100 grams melting ice in a room at 0° C., determine the condition of the mixture after equilibrium is established.

IV. How many grams of steam at 100° C. must be passed into 100 grams melting ice in order to melt the ice and raise its temperatute to 10° C. ?

V. "Were it not for the peculiar action of water at 4° C. our rivers and lakes would freeze to the bottom." Explain fully.

VI. Describe and explain what takes place when a mixture is made of snow and salt,

Or

Explain the construction of the centigrade thermometer.

VII. Give a brief review of the work that you have taken in physics in the past year, stating the most important laws and principles that have been discussed.

VIII. State what you think are the essentials of a good road, and discuss methods for obtaining these essentials in the case of (*a*) a sandy bottom, (*b*) a springy bottom, (*c*) a heavy clay bottom.

IX. Compare the relative merits of gravel and broken stones for a road surface.

Mechanical Department.

I. The system of driving the separators at the creamery is the following:
The pulley A on steam engine is 72 inches in diameter and makes 75 revolutions per minute. This is connected by belt to driven pulley B, 36 inch diameter. The driving pulley C on same shaft as B is 44 inches in diameter, and is connected by belt to rope pulley D, 33 inches in diameter. The driving pulley E, on same shaft as D, is $35\frac{1}{4}$ inches in diameter and is connected by belt to pulley F, 6 inch in diameter. Explain how you would determine the motions of each shaft respectively, by making use of logarithm scale.

II. Shew how to determine the angles 60 degrees and 45 degrees respectively by the square.

III. Give the rule for determining on the square:

(1) An octagon, cut from a 10-inch square.

(2) The length required for a brace.

(3) The measurement of a board.

IV. What are some of the essential points of a well trimmed saw?

V. Give a statement of the shape of the teeth of a cross-cut saw; also the shape of the teeth of one for ripping.

VI. What should be the grinding angle of the bench plane irons? Give the names of each plane respectively in the regular order of working them.

VII. State what difference is meant by merely planing and by trying up; and what should be the position of the plane iron cover for smoothing up?

Steam Engine.

I. Which are the better, gauge cocks, or glass gauges; and which would you be governed by?

II. What should you do when a glass breaks?

III. If the throttle valve should become loose from the stem and prevent the steam from entering the valve-chest, what would you do?

IV. What is a steam engine?

V. What is an engine composed of?

VI. If water should accumulate in the cylinder, what would be the consequence?

III. Papers set at the Final Examinations in the Dairy School, 1894.

Dairy Lectures.

I. Define colostrum, period of lactation, lactochrome, milk scrum, dry matter of milk, solids not fat, olein, stearin, soiling, silo, silage, alfalfa.

II. How does the albumen differ from the casein in milk?

III. Give the arguments for and against paying for milk at cheese factories according to butter-fat.

IV. What amounts of money should A, B, C, and D receive, paying by test, when each sent milk as follows:

A, 2,000 lb. of 3 per cent. milk.
B, 1,500 " 3 " "
C, 1,000 " 3.5 " "
D, 1,500 " 4 " "

Pounds of cheese = 600, price = 10 cents per pound.

Cost of manufacturing:

For shareholders 1.5 cents per lb.; for non-shareholders 2 cents per lb.

A and C are shareholders; B and D non-shareholders.

V. Give an average percentage composition of (1) butter; (2) cheese. Also give a scale of points for judging both.

VI. What objections may be urged against the transudation theory of the secretion of milk?

VII. In deciding the method of creaming to adopt, what points should be taken into consideration?

VIII. How do bacteria get into milk?

IX. Name some advantages of (1) the silo and silage; (2) soiling and soiling crops.

X. Write short notes on Jersey, Holstein-Friesian, Ayrshire, American Holderness Kerry, and Brown Swiss cattle.

Outside Lectures.

I. (*a*) 1.03 being the specific gravity of normal milk, state in grams the weight of one litre.

(*b*) Reduce 16 degrees C. to F.

II. Enumerate the advantages that have been derived from a study of fertilization in plants.

III. Name six of the most important minerals that enter into the composition of the soil, and the chief agents which aid in rock disintegration.

IV. The percentage of butter-fat in a sample of pure milk is 3.6. If to every ten gallons of this milk two gallons of water is added, find the percentage of butter fat in the diluted milk. If 4,000 lb. of the pure milk is furnished during one week, and 7,200 lb. of the diluted milk furnished the second week, find the average percentage of butter-fat for the two weeks.

V. Give the principal points of difference between Berkshire and improved Yorkshire hogs, and explain the importance of a well balanced ration for dairy cows, showing wherein the German feeding standard differs from the American.

VI. Give symptoms and treatment for impaction of the rumen (1st stomach).

Milk-Testing.

I. Indicate the steps necessary for the detection of adulterated milk, and tell to what extent the following sample has been adulterated, supposing the pure milk to contain 9 per cent. S.N.F: L. reading 30, temp. 67 degrees fat 1.7 per cent. 15.

II. Give the Sp. G. and per cent. of solids not fat, total solids and water in the above sample. 10.

III. Explain why skim milk shows a high L. reading, and watered milk a low reading. 10.

IV. Explain the graduated scale on the stem of the Quevenne lactometer. 10.

V. Describe the mode of performing a test by the "Babcock," so as to get accurate results, supposing bottles, etc., to be correct. 15.

VI. Give all the causes which produce dark, cloudy readings, also light, curdy readings. 10.

VII. How much milk by weight is supposed to be placed in the "Babcock" bottle, and why do we use a 17.6 c.c. pipette? 10.

VIII. In taking samples each morning for the composite test, what is the principal thing to be aimed at? 10.

IX. If cream should gather on the samples so as not to mix readily with the milk before testing, how would you proceed to get accurate results? 10.

Cream Separators.

I. Describe the principle of the separation of cream from milk by the separator. 20.

II. (*a*) What would be the loss in pounds of fat on 5,000 lb. of milk, if the separator were to leave .2 per cent. in milk? 5.

(*b*) What would be the value of the fat, butter being worth 24c. per lb? 5.

III. (*a*) What per cent. of cream is most desirable for making good butter and to churn exhaustively? 5.

(*b*) If the cream from Russian and Alexandra separators be too thin, how could they be made to give off thicker cream? 10.

(*c*) If too thick from United States and Alpha separators, how could they be made to give off thinner? 10.

(*d*) Describe method of thinning cream of Danish separator 5.

Speed and feed considered perfect in all the above separators.

IV. If separator should vibrate when at full speed, what would likely be the cause How could it be remedied? 5.

V. If bowl should sway when at full speed or when starting, (*a*) What would cause it? (*b*) How could it be remedied? The separators in each case to be level and properly set up. 5.

VI. What size pulley in diameter would be required to drive separator at proper speed, shafting to run 200 revolutions per minute, intermediate to run 950, pulley of intermediate $4\frac{1}{2}$ inches? 10.

VII. Name five important points to be observed in setting up and starting a belt separator. 15.

VIII. Describe a proper oil to be used on separator. 5.

Butter-Making.

I. Give the advantages and disadvantages of the separator and cream gathering creamery. 20.

II. (*a*) What is meant by "A creamery inch" 5.
(*b*) What would be the value of 48 inches of cream testing by oil test 120 per cent. at 16c. per inch? 5.
(*c*) If the actual yield was 65 pounds of butter, what per cent. would the manufacturer gain? 5.

III. What is meant by the term "Ripening cream" in butter-making? Describe the best method of ripening separator cream. 15.

IV. Describe the steps necessary for converting the cream into first-class butter, packed for export. 30.

V. What would probably cause cream to froth and refuse to churn? How could it be remedied. 10.

VI. Give the proper method for heating or cooling cream to prepare it for the churn. 10.

Cheese-Making.

I. Name the chief factors and principal agents which are utilized in the manufacture of cheese.

II. Describe the rennet test and its advantages or disadvantages, if any, to cheese-makers.

III. Should milk be ripened to the same degree of ripeness by the rennet test at all seasons and under all conditions; if not, state reasons and probable results?

IV. Does it ever become necessary and advisable to draw off a portion of the whey from the curd soon after heating up? If so, give reasons for it.

V. Describe the hot iron test and its advantages to cheese-makers. If at any stage in the process of cheese-making it fails to be a guide, state when and why.

VI. What length of string on hot iron should curd have for the removal of all the whey for spring, summer, and fall cheese, also at grinding for same?

VII. At about what temperature should milk and curd be at the following stages: (*a*) Milk at setting? (*b*) curd when cooked, and up to the time of milling? (*c*) when put to press?

VIII. State length of time required to make cheese from good milk from the time of adding the rennet until salting for summer and fall cheese, and how best to attain that time.

IX. Give best method of handling over-ripe milk and manufacturing same into cheese.

X. Describe method of preparing a starter. Also state the advantages in using it and how its use may be abused.

APPENDIX IV.

CLASS LISTS—EASTER EXAMINATIONS, 1894—FIRST YEAR.*

Agriculture.

Class I.

1 Clark, J. F.
2 Paterson, T. F.
3 Lang, L. W.
4 { Carlyle, S. C.
Lewis, Geo.
6 Campbell, W. G.
7 Ponting, E. A.
8 Dunn, E.
9 McCallan, E. A.
10 { Loghrin, S.
Summerby, W. L.
Wallbridge, J. S.
13 Kipp, A.
14 { Chadsey, G. E.
Knight, J. W.

Class II.

1 { Cass, L. H.
Gouin, B.
McKinley, W. W.
Tye, C. W.
5 Taylor, W. H.
6 Wilson, A. C.
7 Cowieson, W. R.
8 McPhail, J. D.
9 Kippen, N.
10 McDougall, D. H.
11 Smith, G. A.
12 { Edelsten, E. J. M.
Maconachie, G. R.
McGillivray, J. W.

Class III.

1 Struthers, J. B.
2 DeHart, R. A.
3 Shotwell, W. M.
4 { Harvard, H. F.
Robinson, H. J.
Rogers, C. H.
Thompson, W. J.
Wilson, N. F.
Whetter, J. R.
10 Thom, W. E.
11 { Maclennan, J. F.
Macpherson, D. J.
Merritt, L. A.
Smith, P. B.
15 Evans, A. R.
16 Silcox, C. P.
17 Bard, A. L.
18 { Balfour, T. B.
Clunn, H. E.
20 Macdonald, A. N.
21 { Bowker, C. G.
Bruneau, A. E.

Failed.

Smith, C. F.
Gillespie, C. A.
Aylen, C. S. F.

Chemistry.

Class I.

1 Clark.
2 Carlyle.
3 { Lang.
Summerby.
5 Paterson.
6 Thompson.

Class II.

1 Kipp.
2 Lewis.
3 { Chadsey.
Rogers.

Class III.

1 Loghrin.
2 { McDougall.
McCallan.
4 Wilson, N. F.
5 Thom.
6 { Dunn.
Maclennan.
Maconachie.
9 Edelsten.
10 { Knight.
Taylor.
12 Gouin.
13 Campbell.
14 Tye
15 Wallbridge.
16 Macpherson.
17 Wilson, A. C.
18 { McPhail.
Smith, P. B.
20 Smith, G. A.
21 McKinley.
22 { Merritt.
Struthers.
24 { McGillivray.
Ponting.
26 Robinson.
27 { Cass.
Whetter.
Kippen.

Failed.

Harvard.
Bowker.
Silcox.
DeHart.
Bruneau.
Evans.
Shotwell.
Clunn, H. E.
Balfour.
Bard.
Smith, C. F.
Cowieson.
Gillespie.
Aylen.
Macdonald.

Geology.

Class I.

1 Summerby.
2 Clark.
3 Paterson.
4 McCallan.
5 Lang.
6 Chadsey.
7 Carlyle.

Class II.

1 Smith, P. B.
2 { Maconachie.
Lewis.
4 Smith, G. A.
5 Campbell.
6 { Loghrin.
Gouin.
8 Robinson.
9 Taylor.
10 Knight.
11 Edelsten.
12 McDougall.

Class III.

1 Dunn.
2 { McGillivray.
Tye.
4 Cass.
5 { Wilson, A. C.
Maclennan.
7 Silcox.
8 Thom.
9 Kipp.
10 Merritt.
11 Wilson, N. F.
12 McPhail.
13 Macpherson.
14 { Rogers.
Thompson.
16 McKinley.
17 { Struthers.
Ponting.
19 Kippen.
20 Bowker.
21 Clunn, H. E.
22 { Balfour.
Wallbridge.
24 Clunn, W. P.
25 DeHart.
26 Whetter.
27 Cowieson.
27 Bruneau.

Failed.

Harvard.
Shotwell.
Macdonald.
Gillespie.
Bard.
Evans.
Smith, C. F.
Aylen.

Zoology.

Class I.

1 Clark.
2 Summerby.
3 Campbell.
4 { Paterson.
Smith, G. A.
6 McCallan.
7 Lewis.

Class II.

1 Lang.
2 Carlyle.
3 Chadsey.
4 Knight.
5 Smith, P. B.
6 Edelsten.
7 Wilson, A. C.
8 Macpherson.
9 Cass.
10 Gouin.

Class III.

1 McKinley.
2 Clunn, W. P.
3 Kipp.
4 { Tye.
Dunn.
6 Loghrin.
7 McDougall.
8 Silcox.
9 { DeHart.
Kippen.
11 { Maconachie.
Wallbridge.
13 McGillivray.
14 Wilson, N. F.
15 { Cowieson.
Taylor.
17 Ponting.
18 Rogers.
19 Struthers.
20 { Thom.
Balfour.
22 Maclennan.
23 Merritt.
24 Thompson.
25 Smith, C. F.
26 { Clunn, H. E.
Macdonald.
28 McPhail.
29 { Robinson.
Whetter.
31 { Bowker.
Harvard.

Failed.

Bard.
Gillespie.
{ Evans.
Shotwell.
Bruneau.
Aylen.

Veterinary Anatomy.

Class I.

1 Carlyle.
2 { Lang.
Clark.
4 { Paterson.
Summerby.
6 Kipp.

Class II.

1 Wilson, A. C.
2 Chadsey.
3 McCallan.
4 Loghrin.
5 { Lewis.
Campbell.
7 McDougall.
8 Knight.

Class III.

1 Edelsten.
2 Smith, P. B.
3 Smith, G. A.
4 { Maconachie.
Taylor.
6 Thom.
7 { Thompson, W. J.
Dunn.
Evans.
10 { Wallbridge.
Kippen.
12 { Shotwell.
Tye.
14 { Wilson, N. F.
Ponting.
16 { Macpherson.
Maclennan.
18 Cass.
19 { Gouin.
McKinley.
21 { DeHart.
McGillivray.
Struthers.
24 Rogers.
25 { Silcox.
Cowieson.
27 { Clunn.
Bruneau.
Harvard.
30 { Robinson.
McPhail.
Balfour.

Failed.

Bard.
Macdonald.
Smith, C. F.
Bowker.
Whetter.
Merritt.
Aylen.
Gillespie.

* For general proficiency see page 229.

CLASS LISTS—EASTER EXAMINATIONS, 1894 (*Continued*)—FIRST YEAR.

Literature.

CLASS I.

- 1 Clark.
- 2 Summerby.
- 3 Gouin.

CLASS II.

- 1 McCallan.
- Edelsten.
- 3 Cass.
- Paterson.
- 5 Lang.
- Maconachie.

CLASS III.

- 1 Kipp.
- 2 Carlyle.
- 3 Bowker.
- 4 Lewis.
- Smith, P. B.
- 6 Smith, G. A.
- 7 Taylor.
- 8 Dunn.
- DeHart.
- Wilson, A. C.
- 11 Robinson.
- 12 Campbell.
- Knight.
- Thompson, W. J.
- Wilson, N. F.
- 16 Chadsey.
- Loghrin.
- Silcox.
- Tye.
- 20 McKinley.
- 21 McPhail.
- McDougall.
- 23 McGillivray.
- Ponting.
- Smith, C. F.
- 26 Merritt.
- Rogers.
- Wallbridge.
- 29 Cowieson.
- Thom.
- 31 Harvard.
- Macpherson.

FAILED.

- Maclennan.
- Balfour.
- Bard.
- Struthers.
- Kippen.
- Shotwell.
- Evans.
- Clunn.
- Whetter.
- Aylen.
- Gillespie.
- Bruneau.
- Macdonald.

Grammar and Composition.

CLASS I.

- 1 Lang.
- 2 Clark.

CLASS II.

- 1 Gouin.
- 2 Summerby.
- 3 Maconachie.
- 4 Dunn.
- 5 McCallan.

CLASS III.

- 1 Paterson.
- 2 Carlyle.
- Chadsey.
- Thom.
- 5 Edelsten.
- 6 Campbell.
- Knight.
- McKinley.
- Smith, G. A.
- 10 McDougall.
- 11 Rogers.
- 12 Wilson, A. C.
- 13 Bowker.
- Cass.
- 15 Lewis.
- Roblin.
- 17 Merritt.
- 18 Smith, P. B.
- Taylor.
- Tye.
- 21 Kipp.
- 22 Loghrin.
- Wallbridge.
- 24 Wilson, N. F.
- 25 Struthers.
- 26 Thompson.
- 27 Evans.
- McPhail.
- Gillespie.
- Ponting.
- Macdonald.
- Macpherson.

FAILED.

- Cowieson.
- DeHart.
- Harvard.
- Silcox.
- Smith, C. F.
- Bruneau.
- Maclennan.
- McGillivray.
- Kippen.
- Clunn.
- Balfour.
- Bard.
- Whetter.
- Shotwell.
- Aylen.

Arithmetic.

CLASS I.

- 1 Clark.
- 2 Summerby.
- 3 Paterson.

CLASS II.

- 1 Wilson, A. C.
- 2 Lang.
- 3 Smith, G. A.
- 4 Campbell.
- 5 Maconachie.
- McKinley.
- 7 Lewis.

CLASS III.

- 1 Carlyle.
- 2 Chadsey.
- Edelsten.
- 4 DeHart.
- Taylor.
- 6 Kipp.
- 7 Gouin.
- Maclennan.
- Macpherson.
- Thom.
- Tye.
- 12 McCallan.
- 13 Knight.
- Wallbridge.
- Wilson, N. F.
- 16 Smith, P. B.
- 17 Bruneau.
- 18 Rogers.
- 19 Thompson.
- 20 Whetter.
- 21 Loghrin.
- 22 Bowker.
- Evans.
- McDougall.
- Merritt.
- Ponting.
- 27 Cass.
- Dunn.
- McPhail.

FAILED.

- Gillespie.
- Robinson.
- Bard.
- Kippen.
- McGillivray.
- Macdonald.
- Struthers.
- Cowieson.
- Shotwell.
- Clunn.
- Smith, C. F.
- Harvard.
- Silcox.
- Balfour.
- Aylen.

Bookkeeping.

CLASS I.

- 1 Clark.
- 2 Paterson.
- 3 Summerby.
- 4 Campbell.
- McCallan.
- 6 Lang.
- 7 Kipp.
- Rogers.
- 9 Maconachie.
- 10 Ponting.
- Tye.
- 12 Chadsey.

CLASS II.

- 1 Smith, P. B.
- 2 Lewis.
- 3 Thompson.
- 4 Edelsten.
- Taylor.
- 6 Loghrin.
- 7 DeHart.
- 8 Knight.
- Gouin.
- McKinley.
- Thom.
- 12 McPhail.
- Smith, G. A.
- 14 Wilson, N. F.
- 15 Macpherson.
- Wilson, A. C.
- 17 Merritt.
- Carlyle.
- 19 Wallbridge.
- 20 Cass.

CLASS III.

- 1 Maclennan.
- Struthers.
- 3 Bruneau.
- 4 Bard.
- McDougall.
- 6 McGillivray.
- 7 Whetter.
- 8 Bowker.
- 9 Cowieson.
- Dunn.
- Kippen.
- Macdonald.
- Shotwell.
- 14 Evans.
- 15 Silcox.
- Harvard.
- 17 Balfour.

FAILED.

- Gillespie.
- Smith, C. F.
- Robinson.
- Clunn.
- Aylen.

*CLASS LISTS—EASTER EXAMINATIONS, 1894—SECOND YEAR.

Agriculture.

Class I.

1 King, A. A.
2 Wheatley, Jno.
3 Simpson, A. E.
4 Reinke, C. E.
5 Robertson, G. A.
6 Widdifield, J. W.

Class II.

1 Elliott, Wm.
2 Fitzgerald, J. P.
Kennedy, W. A.
4 Kidd, D. F.
5 Henderson, R. H.
6 Christian, A. H.
Cook, J. H.
8 Lailey, F. T.
Laird, J. G.
Vipond, J. M.
11 Smyth, F. L.
12 Thompson, W. J.

Class III.

1 Wilson, E. E.
2 Buchanan, Jno.
3 Doherty, M. W.
4 High, A. M.
5 Wood, R. S.
6 Caldecott, F.
7 Rowe, F.
8 Duffett, G. P.
9 Shorley, S. C.
Traviss, C. H.
11 Carrick, C. S.
12 McKay, W. E.
13 Graesser, F. A.

Judging Cattle.

Class I.

1 King.
2 Simpson.
3 Kennedy.
4 Elliott.
5 Laird.
Thompson.
Wheatley.
8 Robertson.
9 Kidd.
Widdifield.
11 Traviss.
Vipond.

Class II.

1 Caldecott.
2 Doherty.
High.
Reinke.
Wilson.
6 Christian.
7 Cook.
8 Buchanan.
9 Carrick.
Henderson.
McKay.
12 Lailey.
Rowe.
14 Duffett.
15 Wood.
16 Smyth.

Class III.

1 Fitzgerald.
2 Shorey.
3 Graesser.
4 Clunn, W. P.

Judging Sheep.

Class I.

1 Elliott.
2 Simpson.
3 Buchanan.
Thompson,
5 Carrick.
6 King.
Widdifield
8 Cook.
Kennedy.
High.
11 Laird.
12 Smyth.
13 Christian.
Traviss.
Wheatley.

Class II.

1 Reinke.
Vipond.
Wilson.
4 Caldecott.
Lailey.
6 Doherty.
Robertson.
8 Duffett.
Fitzgerald.
10 Shorey.
11 McKay.
12 Henderson.

Class III.

1 Wood.
2 Kidd.
3 Clunn, W. P.
4 Graesser.
5 Rowe.

Dairying.

Class I.

1 Robertson.
2 Kennedy.
3 Christian.
4 Kidd.
5 Cook.

Class II.

1 Wheatley.
2 Laird.
Buchanan.
4 High.
5 Doherty.
6 Henderson.
7 Widdifield
Rowe.
9 King.
Wilson.
11 Duffett.
Vipond.
13 Carrick.
14 Traviss.
15 Simpson.

Class III.

1 Reinke.
2 Fitzgerald.
3 Smyth.
4 Graesser.
Elliott.
6 Shorey.
7 Lailey.
8 McKay.
9 Thompson.
10 Wood.
11 Caldecott.

Horticulture.

Class I.

1 Robertson.
2 Wheatley.
3 King.
4 Christian.

Class II.

1 Kidd.
2 Reinke.
3 Henderson.
4 Buchanan.
5 Wilson.
6 Laird.
7 Widdifield
High.
9 Kennedy.
10 Shorey.
11 Simpson.
12 Thompson.

Class III.

1 Rowe.
2 Traviss.
3 Vipond.
Elliott.
Lailey.
6 Duffett.
7 Cook.
Carrick.
9 Smyth.
10 Fitzgerald.
11 Doherty.
12 Graesser.
13 McKay.

Failed.

Caldecott.

Agricultural Chemistry.

Class I.

1 Widdifield.
2 King.
Wheatley.
4 Henderson.
5 Kennedy.
6 Cook.
Robertson.
8 Buchanan.
9 Kidd.

Class II.

1 Doherty.
2 Carrick.
3 Rowe.
Wood.
5 Duffett.
6 Christian.
7 High.
8 Lailey.
9 Reinke.
10 Simpson.
11 Laird.

Class III.

1 Thompson.
2 Smyth.
Vipond.
4 Elliott.
5 Caldecott
6 Wilson.
7 Traviss.
8 Shorey.
9 Fitzgerald.

Failed.

Graesser.
McKay.

* For general proficiency see page 229.

CLASS LISTS—EASTER EXAMINATIONS, 1894 (*Continued*)—SECOND YEAR.

Veterinary Pathology.

CLASS I.

1 Wheatley.

CLASS II.

1 King.
2 Fitzgerald.
3 Kidd.
4 Cook.
Kennedy.
6 Buchanan.
7 Robertson.
Doherty.

CLASS III.

1 Laird.
2 Henderson.
Duffett.
Simpson.
Vipond.
6 Reinke.
7 Rowe.
8 High.
Elliott.
10 Thompson.
Carrick.
12 Christian.
13 Wilson.
14 Wood.
15 Smyth.
16 Widdifield.
17 Traviss.
18 Graesser.
19 Lailey.
20 Shorey.
Caldecott.
22 McKay.

Practical Horse.

CLASS I.

1 Kidd.
2 Doherty.
3 Wilson.

CLASS II.

1 Cook.
Elliott.
Lailey.
Thompson.
Kennedy.
6 Christian.
Fitzgerald.
Vipond.
9 Reinke.
Robertson.
11 High.
Simpson.
Widdifield.
14 Laird.
15 King.

CLASS III.

1 Carrick.
Traviss.
Wheatley
4 Wood.
5 Duffett.
6 Henderson.
Rowe.
8 Caldecott.
9 Smyth.
10 Buchanan.
Graesser.
12 Clunn.
McKay.
Shorey.

Literature.

CLASS I.

1 Doherty.
Lailey.
3 Widdifield.

CLASS II.

1 Wheatley.
Hender on.
3 High.
4 Reinke.
Elliott.
6 Simpson.
7 Robertson.
8 Kidd.
9 Rowe.
10 Cook.
Shorey.
Duffett.
13 Buchanan.
Kennedy.
15 Christian.
King.

CLASS III.

1 Laird.
2 Wilson.
Carrick.
4 Caldecott.
5 Smyth.
6 Graesser.
7 Thompson.
8 Traviss.
9 Vipond.
10 Fitzgerald.

FAILED.

McKay.

Political Economy.

CLASS I.

1 Wood.

CLASS II.

1 Buchanan.
2 Duffett.
3 Widdifield.
4 Robertson.

CLASS III.

1 Cook.
Lailey.
Wheatley.
4 Kidd.
5 Kennedy.
6 King.
7 Reinke.
8 Christian.
9 Elliott.
10 Shorey.
11 Carrick.
Simpson.
13 Caldecott.
14 Smyth.
Fitzgerald.
Henderson.
17 McKay.
18 Wilson.
19 Vipond.
Graesser.
21 Rowe.
High.
23 Traviss.
24 Doherty.
Thompson.
Laird.

Hydrostatics.

CLASS I.

1 Wheatley.
2 Robertson.
3 Kennedy.
Simpson.

CLASS II.

1 Buchanan.
2 Lailey.
Widdifield.
Rowe.
5 King.
Reinke.
7 Christian.
Cook.
Vipond.
10 Doherty.
11 Kidd.
12 Graesser.
13 Caldecott.
Duffett.
Henderson.
High.

CLASS III.

1 Elliott.
2 Traviss.
Wilson.
4 Thompson.
5 Carrick.
Smyth.
7 Laird.
8 Fitzgerald.
9 Shorey.
10 McKay.

Drawing.

CLASS I.

1 Buchanan.
2 Rowe.

CLASS II.

1 Reinke.
2 Robertson.
3 Kennedy.
4 Christian.
Carrick.
6 Laird.
7 High.
8 Henderson.
Wilson.
10 Elliott.
Simpson.
Vipond.
13 Caldecott.
Duffett.

CLASS III.

1 Fitzgerald.
Kidd.
3 Doherty.
4 Lailey.
Shorey.
6 King.
Thompson
Wheatley.
Widdifield.
10 Cook
11 Traviss.
12 Graesser
13 Smyth.
14 McKay.

CLASS LISTS—MIDSUMMER EXAMINATIONS, 1894—FIRST YEAR.*

Agriculture.

Class I.

1 Clark, J. F.
2 Paterson, T. F.
3 Lang, L. W.
4 Rive, E.
5 Carlyle, S. C.
6 Summerby, W. L.
7 Campbell, W. G.
8 Thompson, W. J.

Class II.

1 Wilken, A. G.
2 Lewis, G.
3 McPhail, J. D.
4 McCallan, E. A.
5 { Knight, J. W.
Taylor, W. H. }
7 Dunn, E.
8 Whetter, J. R.
9 { Kipp, A.
Maconachie, G. R. }
11 { Edelsten, E. J. M.
Tye, C. W. }
13 { McDougall, D. H.
Wallbridge, J. S. }
15 { Cass, L. H.
McKinley, W. W.
Struthers, J. B. }
18 Chadsey, G. E.

Class III.

1 Payne, G. Y.
2 Loghrin, S.
3 { McGillivray, J W.
Smith, G. A. }
5 { Ponting, E. A.
Wilson, A. C. }
7 Macdonald, A. N.
8 Kippen, N.
9 Cowieson, W. R.
10 Rogers, C. H.
11 Wilson, N. F.
12 Maclennan, J. F.
13 Bard, A. L.
14 Silcox, C. P.
15 Balfour, T. B.
16 Evans, A. R.
17 Shotwell, W. M.

Dairying.

Class I.

1 Lewis.
2 Clark.
3 Campbell.
4 Summerby.
5 Loghrin.
6 Carlyle.
7 McCallan.
8 Lang.
9 Wilken.
10 McKinley.
11 Paterson.
12 Tye.
13 Chadsey.
14 McDougall.
15 Dunn.
16 Cowieson.
17 { Knight.
Cass. }

Class II.

1 Wilson, N. F.
2 Whetter.
3 Payne.
4 { Kippen.
Rive. }
6 Walbridge.
7 Taylor.
8 Thompson.
9 { Wilson, A. C.
Shotwell. }
11 { Smith, P. B.
Smith, G. A. }
13 McPhail.
14 Edelsten.
15 Kipp.
16 McGillivray.

Class III.

1 Thom.
2 { Evans.
Robinson. }
4 Struthers.
5 { Maconachie.
Bard. }
7 Silcox.
8 Maclennan.
9 Macdonald.
10 Macpherson.

Bee-keeping.

Class II.

Rive.

Class III.

1 Clark.
2 Carlyle.
3 Campbell.
4 { Maclennan.
Knight.
Kipp. }
7 Chadsey.
8 Thom.
9 { Loghrin.
Lewis. }
11 Lang.
12 { Paterson.
Silcox.
Taylor. }
15 { Edelsten.
Summerby. }
17 { Tye
McDougall. }
19 Rogers.
20 Kippen.
21 Cass.
22 { Clunn.
Thompson. }
24 { Wilson, N. F.
Cowieson.
Wilson, A. C.
Smith, P. B.
Whetter. }

Failed.

Shotwell.
McCallan.
Struthers.
Wallbridge.
Maconachie.
McPhail.
Wilken.
Ponting.
Machperson.
Smith, G. A.
Payne.
McKinley.
McGillivray.

Materia Medica.

Class I.

1 Paterson.
2 { Lang.
Clark.
Carlyle. }

Class II.

1 Edelsten.
2 Chadsey.

Class III.

1 Knight.
2 Rive.
3 McDougall.
4 Summerby.
5 { Thompson.
Dunn.
Lewis. }
8 Smith, G. A.
9 { Cass.
Campbell. }
11 { Kipp.
Kippen. }
13 { Wilken.
Loghrin.
McKinley.
Wilson, N. F. }
17 { McCallan.
Maconachie. }
19 Wallbridge.
20 Taylor.
21 { Macdonald.
McPhail. }
23 { Ponting.
Thom. }
25 { Rogers.
Smith, P. B. }
27 Robinson.
28 Whetter.
29 { Maclennan.
McGillivray.
Tye. }
32 Balfour.
33 Wilson, A. C.

Failed.

Bard.
Struthers.

* For general proficiency see page 229.

CLASS LISTS—MIDSUMMER EXAMINATIONS, 1894 (*Continued*)—FIRST YEAR.

Botany.

Class I.

1 Clerk.
2 Paterson.
3 Summerby.
4 Knight.

Class II.

1 Rive.
2 Loghrin.
3 Lewis.
4 Lang.
5 Campbell.
6 Chadsey.
7 { Maconachie.
Wilson, A. C.
Carlyle. }
10 { Edelsten.
Smith, P. B. }

Class III.

1 Kipp.
2 Thompson.
3 Wilson, N. F.
4 Dunn.
5 Wilken.
6 Ponting.
7 { Maclennan.
Smith, G. A.
McGillivray. }
10 { Kippen.
McCallan. }
12 Rogers.
13 { Cass.
McKinley.
Tye. }
16 Taylor.
17 Bowker.
18 Struthers.
19 { Thom.
Bard. }
21 Wallbridge.
22 { Whetter.
Payne. }
24 McDougall.
25 Merritt.

Literature.

Class I.

1 Rive.
2 Edelsten.
3 Clark.
4 Paterson.

Class II.

1 Summerby.
2 Cass.
3 Lang.
4 { McCallan.
Smith, G. A. }
6 Carlyle.
7 { Campbell.
Lewis. }

Class III.

1 Thompson.
2 { Knight.
Loghrin. }
4 { Maconachie.
Rogers. }
6 Kipp.
7 Tye.
8 Taylor.
9 Smith, P. B.
10 McKinley.
11 McDougall.
12 Wilson, A. C.
13 { Chadsey.
Dunn. }
15 Thom.
16 Maclennan.
17 McPhail.
18 Struthers.
19 { McGillivray.
Wilson, N. F. }
21 { Cowieson.
Kippen.
Payne.
Whetter. }

Failed.

Bard.
Ponting.
Smith, C. F.
Bowker.
Robinson.

Grammar and Composition.

Class I.

1 Summerby.
2 Clark.
3 Lang.
4 Carlyle.
5 Rive.

Class II.

1 Paterson.
2 McKinley.
3 Maconachie.
4 Smith, G. A.
5 Campbell.
6 Edelsten.

Class III.

1 Loghrin.
2 Cass.
3 McDougall.
4 Merritt.
5 Chadsey.
6 Struthers.
7 Taylor.
8 Dunn.
9 Thom.
10 McCallan.
11 Thompson.
12 { Smith, P. B.
Tye. }
14 { Knight.
Robinson. }
16 Lewis.
17 { Rogers.
Wilson, A. C. }
19 Macpherson.
20 Wilken.
21 Kipp.
22 McPhail.
23 Payne.
24 { Maclennan.
Wallbridge. }
26 McGillivray.
27 { Evans.
Whetter.
Smith, C. F.
Wilson, N. F. }

Arithmetic.

Class I.

1 Clark.
2 Summerby.
3 Paterson.

Class II.

1 McKinley.
2 Campbell.
3 Rive.
4 Lang.
5 Carlyle.
6 Tye.

Class III.

1 Taylor.
2 McCallan.
3 Dunn.
4 Wilson, A. C.
5 Smith, G. A.
6 { Loghrin.
Wilson, N. F. }
8 { Evans.
McDougall. }
10 { Cass.
Wallbridge. }
12 { Thompson.
Wilken. }
14 Lewis.
15 Whetter.
16 Chadsey.
17 { Bowker.
Struthers. }
19 Kipp.
20 Rogers.
21 { Knight.
Thom. }
23 { McPhail.
Smith, P. B. }
25 Edelsten.
26 Shotwell.
27 Maconachie.
28 { Cowieson.
Merritt.
Ponting. }

Failed.

Bard.
Payne.
Kippen.

CLASS LISTS—MIDSUMMER EXAMINATIONS, 1894 (*Continued*)—SECOND YEAR.*

Agriculture.

Class I.

1 Buchanan, Jno.
2 King, A. A.
3 Cook, J. H.
4 Robertson, G. A.

Class II.

1 Henderson, R. H.
2 Kennedy, W. A.
3 Christian, A. H.
4 Wheatley, Jno.
5 Duffett, G. P.
6 Fitzgerald, J. P.
7 Elliott, Wm.
8 Simpson, A. E.
9 Widdifield, J. W.
10 Doherty, M. W.
11 Vipond, J. M.
12 Reinke, C. E.
13 Rowe, F.
14 Kidd, D. F.
15 Lailey, F. T.

Class III.

1 Traviss, C. H.
2 Carrick, C. S.
3 Wilson, E. E.
4 High, A. M.
5 Laird, J. G.
6 Smyth, F. L.
7 DeHart, R. A.
8 Shorey, S. C.
9 Graesser, F. A.
10 Caldecott, F.

Failed.

McKay, W. E.

Dairying.

Class I.

1 Wheatley.
2 Elliott.
3 King.
4 Kennedy.
5 Buchanan.
6 Kidd.

Class II.

1 { Laird.
   Henderson.
3 { Cook.
   Duffett.
5 High.
6 Widdifield.
7 Robertson.
8 Vipond.
9 Reinke.
10 Doherty.
11 Rowe.
12 Christian.
13 Simpson.
14 { Smyth.
   Wilson.
16 Fitzgerald.
17 Carrick.

Class III.

1 Graesser.
2 Lailey.
3 Traviss.
4 Caldecott.
5 DeHart.
6 { Shorey.
   McKay.

Agricultural Chemistry.

Class I.

1 Wheatley.
2 Cook.
3 Robertson.
4 Widdifield.
5 Henderson.
6 Reinke.

Class II.

1 Lailey.
2 Kennedy.
3 Rowe.
4 { Buchanan.
   King.
6 Laird.
7 { High.
   Simpson.
9 { Christian.
   Doherty.
11 Kidd.
12 Smyth.
13 { Graesser.
   Wilson.
15 Duffett.
16 Elliott.
17 { Carrick.
   Vipond.
19 Caldecott.
20 Traviss.

Failed.

Fitzgerald.
Shorey.
McKay.
DeHart.

Practical Chemistry.

Class I.

1 King.
2 Wheatley.
3 Smyth.
4 { Graesser.
   Simpson.

Class II.

1 Widdifield.
2 { Cook.
   Christian.
4 { Doherty.
   Robertson.
6 Caldecott.
7 Carrick.
8 Rowe.
9 McKay.
10 { Elliott.
   Kennedy.

Class III.

1 Kidd.
2 High.
3 Traviss.
4 { Buchanan.
   Laird.
6 Henderson.
7 Reinke.
8 Fitzgerald.
9 Wilson.
10 DeHart.
11 Shorey.
12 Duffett.
13 Vipond.
14 Lailey.

Botany.

Class I.

1 Wheatley.
2 King.
3 Robertson.
4 Buchanan.

Class II.

1 Henderson.
2 Widdifield.
3 Kennedy.
4 Reinke.
5 Laird.

Class III.

1 High.
2 Simpson.
3 Kidd.
4 Cook.
5 Lailey.
6 { Shorey.
   Duffett.
8 Wilson.
9 Vipond.
10 Elliott.
11 Fitzgerald.
12 Carrick.
13 { Rowe.
   Doherty.
15 Caldecott.
16 Christian.
17 Smith.
18 DeHart.
19 Traviss.

Failed.

McKay.
Graesser.
Clunn, W. P.

* For general proficiency see page 229.

CLASS LISTS—MIDSUMMER EXAMINATIONS, 1894 (*Continued*)—SECOND YEAR.

Horticulture.

CLASS I.

1 Robertson.
2 Wheatley.
3 Widdifield.
4 Kidd.
5 { Christian.
  { Laird.

CLASS II.

1 Henderson.
2 King.
3 Kennedy.
4 Buchanan.
5 High.
6 Vipond.
7 Duffett.
8 { Shorey.
  { Elliott.
10 Lailey.

CLASS III.

1 { Reinke
  { Simpson.
3 Smyth.
4 Rowe.
5 { Cook.
  { Wilson.
7 Doherty.
8 Carrick.
9 DeHart.
10 Fitzgerald.
11 { Traviss.
  { Caldecott.

FAILED.

McKay.
Graesser.

Veterinary Obstetrics and Laws of Breeding.

CLASS I.

1 Kidd.
2 Wheatley.
3 Kennedy.

CLASS II.

1 Simpson.
2 Widdifie'd.
3 { Buchanan.
  { Robertson.
5 { Henderson.
  { Doherty.
7 Wilson.
8 { Cook.
  { King.
  { Lailey.
  { Reinke.
  { Laird.
13 Duffett.

CLASS III.

1 Rowe
2 Christian.
3 Elliott.
4 { Fitzgerald.
  { Carrick.
6 { Vipond.
  { DeHart.
8 { Smyth.
  { High.
10 Shorey.
11 Caldecott
12 Traviss.
13 Graesser.
14 McKay.

Literature.

LASS I.

1 Lailey.

CLASS II.

1 Widdifield.
2 Rowe.
3 { Kennedy.
  { Wheatley.
5 King.
6 Doherty.

CLASS III.

1 Robertson.
2 Henderson.
3 Duffett.
4 { Buchanan.
  { Laird.
6 Cook.
7 { Kidd.
  { Shorey.
9 Reinke.
10 Simpson.
11 { Wilson.
  { Christian.
13 High.
14 { Smyth.
  { Elliott.
16 Carrick.

FAILED.

Caldecott.
Fitzgerald.
DeHart.
Vipond.
Traviss.
Graesser.
McKay.

Grammar.

CLASS I.

1 Kennedy.

CLASS II.

1 High.
2 Widdifield.
3 { Cook.
  { Duffett.
5 Wheatley.
6 Robertson.
7 Lailey.
8 Doherty.

CLASS III.

1 King.
2 Caldecott.
3 Wilson.
4 Rowe.
5 { Carrick.
  { Christian.
7 Fitzgerald.
8 Reinke.
9 { Shorey.
  { Traviss.
  { Henderson.
12 Laird.
13 Vipond.
14 { Buchanan.
  { Kidd.
  { Simpson.
  { Elliott.

FAILED.

{ McKay.
{ DeHart.
Smyth.
Graesser.

Hydrostatics and Road-making

CLASS I.

1 Robertson.
2 Kennedy.
3 Kidd.
4 Widdifield.

CLASS II.

1 Wheatley.
2 Rowe.
3 { Buchanan.
  { Lailey.
5 Cook.
6 Duffett.
7 Reinke.
8 { Christian.
  { Doherty.
  { King.

CLASS III.

1 { High.
  { Simpson.
  { Vipond.
4 Fitzgerald.
5 Graesser.
6 Smyth.
7 Wilson.
8 Laird.
9 Henderson.
10 Elliott.
11 Traviss.
12 Carrick.
13 Shorey.

FAILED.

Caldecott.
DeHart.
McKay.

COLLEGE STUDENT CLASS LISTS.—GENERAL PROFICIENCY, 1894.

First Year.		Second Year.	
Easter.	Midsummer.	Easter.	Midsummer.
1 Clark.	1 Clark.	1 Wheatley.	1 Wheatley.
2 Summerby.	2 Paterson.	2 Robertson.	2 Robertson.
3 Lang.	3 Lang.	3 King.	3 King.
4 Paterson.	4 Summerby.	4 Kennedy.	4 Kennedy.
5 Carlyle.	5 Rive.	5 Widdifield.	5 Widdifield.
6 McCallan.	6 Carlyle.	6 Kidd.	6 Buchanan.
7 Lewis.	7 Campbell.	7 Cook.	7 Cook.
8 Campbell.	8 Lewis.	8 Simpson.	8 Kidd.
9 Chadsey.	9 Edelsten.	9 Buchanan.	9 Henderson.
10 { Gouin.	10 Loghrin.	10 Reinke.	10 Simpson.
10 { Kipp.	11 Knight.	11 Christian.	11 Doherty.
12 Maconachie.	12 Chadsey.	12 Henderson.	12 Rowe.
13 Edelsten.	13 Cass.	13 Doherty.	13 Reinke.
14 Smith, G. A.	14 { McCallan.	14 { Elliott.	14 Christian.
15 Wilson, A. C.	14 { McKinley.	14 { High.	15 { Lailey.
16 Knight.	16 Thompson.	16 Lailey.	15 { Laird.
17 Loghrin.	17 McDougall.	17 Laird.	17 Duffett.
18 Smith, P. B.	18 Smith, G. A.	18 Duffett.	18 High.
19 Taylor.	19 Tye.	19 Rowe.	19 Elliott.
20 Dunn.	20 Taylor.	20 Vipond.	20 Wilson.
21 Tye.	21 Kipp.	21 Wilson.	21 Carrick.
22 McKinley.	22 Dunn.	22 Carrick.	
23 Cass.	23 Maconachie.	23 Thompson.	
24 McDougall.	24 Wilson, A. C.	24 Fitzgerald.	
25 Thom.	25 Wilson, N. F.	25 Smyth.	
26 Thompson, W. J.	26 Smith, P. B.	26 Traviss.	
27 Rogers.	27 Whetter.	27 Shorey.	
28 Wilson, N. F.	28 Rogers.		
29 Wallbridge.	29 Thom.		
30 Ponting.	30 McPhail.		
31 Macpherson.			
32 McPhail.			

DAIRY SCHOOL STUDENT CLASS LISTS.—GENERAL PROFICIENCY, 1894.

Class I.	Class II.	Class III.
1 Stratton, R. W.	1 Robertson, L.	1 McKenzie, D. A.
2 { Campbell, Wm.	2 Ballantyne, John.	2 Scott, D. F.
2 { Perry, A. D.	3 Calder, A. G.	3 Crosby, J. T.
4 Price, W. W.	4 Briggs, Jas.	4 Philp, D. R.
5 Potter, R. J.	5 Brown, S. P.	5 Miller, R. C.
	6 Hamilton, C. A. W.	6 Henderson, T. A
	7 Edgar, W. A.	7 Milne, R. R.
	8 Carlyle, W. J.	8 Dunn, E. H.
	9 Peacock, Miss G. C.	9 Brodie, G. B.
	10 Hill, J. T.	10 Makinson, T.
	11 Findlay, J. H.	11 Bell, J. W.
	12 Webb, Miss F. I.	12 Elliott, W. J.
	13 Brayley, C. H.	13 Borland, J.
	14 Bell, E. J.	14 Park, A. A.
	15 Pashley, Miss M. S.	15 McCullough, Miss A.
	16 Bell, E. A.	
	17 { Talbot, J. F.	
	17 { Campbell, A.	
	19 Dwyer, Wm.	

APPENDIX V.

FINANCIAL STATEMENT FOR 1894.

College Expenditure.

(a) College Maintenance.

1. *Salaries and Wages*		$16,340 81
2. *Summer Course for Teachers*		370 48
3. *Food*—		
Meat, fish, and fowl		3,687 19
Bread and biscuits, etc		644 37
Groceries, butter, and fruit		4,310 49
4. *Household Expenses*—		
Laundry, soap, and cleaning		362 98
Women servants wages—cooks, laundresses, housemaids, etc		1,866 45
5. *Business Department*—		
Advertising, printing, postage, and stationery		1,048 58
6. *Miscellaneous*—		
Chemicals, apparatus, etc., used in laboratories		499 97
Library and reading-room—books, papers, and periodicals		380 82
Medals		90 90
Unenumerated		833 71
		$30,436 75
(b) Maintenance and Repairs of Government Buildings.		
Furniture and furnishings	$662 57	
Repairs and alterations	961 52	
Fuel	2,574 15	
Light	792 87	
Water	650 00	
Sewage disposal	121 09	
		$5,762 20
		$36,198 95

College Revenue.

Tuition fees	$1,867 08	
Fees for supplemental examinations	58 00	
Charges for gas and chemicals	82 59	
Balances for board after deducting allowances for work in outside departments	5,971 46	
Drippings	2 65	
Sundries	22 51	
Contingencies—breakage, fines, etc	152 55	
		$8,156 84
Net expenditure of College		$28,042 01

The net sum voted by the Legislature for the College and for the maintenance and repairs of Government buildings (see Estimates for 1894, pp. 35 and 41) was $31,611. Hence the unexpended balance under this head for the year 1894 is $3,568 89.

II. Farm Expenditure.

(a) Farm Proper.

1. *Permanent Improvements*—		
Fencing nderdraining, etc		$1,390 48
2. *Farm Maintenance*—		
Salary of superintendent	$1,200 00	
Wages	3,092 84	
Live stock	1,140 62	
Maintenance of stock	628 83	
Seed	283 29	
Binding twine	20 00	
Repairs and alterations	598 75	
Furniture and furnishings, etc	179 52	
Tools and implements	222 71	
Advertising, printing, postage, and stationery	238 08	
Fuel and light	77 84	
Contingencies	157 40	
		$7,839 88
		$9,230 36

Revenue of Farm Proper.

Sale of cattle	$692 20	
" sheep	298 90	
" pigs	595 21	
" horses	70 00	
" sheep skins	10 25	
" milk	99 13	
" wool	90 61	
" wheat	85 10	
" barley	5 00	
" oats	8 05	
" hides	1 50	
" old fence	71 50	
" potatoes	2 15	
Service of animals	117 00	
Keep of animals	148 00	
Rent of cream separator	5 00	
		$2,299 60
Net expenditure (see notes at end of this statement)		$6,930 76

(b) Experimental Plots.

Salaries and wages—	
Experimentalist	$1,500 00
Foreman and teamsters	923 00
Laborers	1,732 56
	4,155 56
Seed	422 03
Manure and special fertilizers	135 64
Furniture, furnishings, and repairs	233 52
Printing, postage, and stationery	117 05
Implememts	223 95
Contingencies	133 62
Expenditure for the year	$5,421 37

Unexpended balance for the year, $411 63.

III. Dairy Department.

(a) Experimental Dairy.

Salary of foreman		$600 00
Wages of cattleman, milkers, etc		581 07
Temporary assistance		148 45
		1,329 52
Purchase of stock—cows and pigs		2,378 98
Maintenance of stock		814 25
Furniture, furnishings and repairs (including blacksmithing)		430 87
Laboratory expenses—gas, chemicals, etc		118 98
Advertising, printing, postage and stationery		61 54
Fuel		389 39
Contingencies		264 97
		$5,788 50

Revenue of Experimental Dairy.

Sale of butter	$820 91	
" cheese	90 83	
" milk	64 08	
" pigs	665 77	
" cattle	95 00	
" hides	3 10	
Service of animals	1 00	
		$1,740 69
Net expenditure of experimental dairy		$4,047 81

Unexpended balance for the year, $662 19.

(b) Dairy School.

Wages of instructors, helpers, and engineer	$1,375 00	
Purchase of milk for use in school	6,006 63	
	$7,381 63	

Revenue of Dairy School.

Sale of butter	$2,029 86		
" cheese	1,162 72		
" whey	30 00		
" skim milk	1 84		
Fees	439 00		
		$3,663 42	
			$3,718 21

Unexpended balance for the year, $181.79.

(c) Travelling Dairy

Expenses of travelling dairy—1st May to 17th Dec	$2,073 42	
Less revenue—horses sold	80 00	
Net expenditure of travelling dairy	$1,993 42	

Unexpended balance for the year, $806.58.

Total expenditure of experimental dairy, dairy school, and travelling dairy	$9,759 44

(d) Poultry Department.

Salary of manager	$125 00	
Purchase of poultry	664 81	
Feed	20 96	
Furnishings	70 08	
Fuel and light for office	16 80	
Contingencies	2 35	
Expenditure of poultry department	$900 00	

III. Horticulture, Gardens, Lawn, Arboretum, Etc.

1. Permanent improvements—underdraining		$168 54	
2. Maintenance—			
Salary of gardener	$550 00		
Salary of assistant gardener	500 00		
Wages of teamster	336 00		
Wages of laborers	1,477 15		
	2,863 15		
Seeds, plants, shrubs, etc	106 60		
Manure and fertilizers	36 30		
Furnishings, repairs, etc	259 77		
Fuel and light for botanical laboratory and greenhouses	538 39		
Contingencies	64 15		
		$3,868 36	
		$4,036 90	
Less produce sold		11 70	
Net expenditure of horticultural dept			$4,025 20

Unexpended balance for the year, $490 80.

IV.—Mechanical Work—Construction of Buildings, Etc.

Salary of foreman	$700 00	
Salary of carpenter	650 00	
Tools, etc	30 12	
Fuel	21 02	
Expenditure for the year		$1,401 14

Unexpended balance for the year, $22.86.

Summary.

Total net expenditure of all departments in 1894—	
I. College and Government buildings	$28,042 11
II. Farm—	
1. Farm proper (see notes below)	6,930 76
2. Experimental plots	5,421 37
3. Dairy dept—experimental dairy, dairy school, and travelling dairy	9,759 44
4. Poultry department—wages, stock, etc	900 00
III. Horticulture—gardens, orchard, lawn, greenhouses, arboretum, etc	4,025 20
IV. Mechanical work—construction of buildings, etc	1,401 14
	$56,480 02

Unexpended balances on the year's operations in all departments, $5,142 48.

The amount paid by the College to students for work in the outside departments in 1894 was $3,309.18 This was done by crediting on board bills the sums allowed to students from week to week by the foreman under whom they worked.

Notes on Statement.

Without going into a formal statement of accounts between different departments, I may say that *the Farm Proper is entitled to credit* from several of the other departments—

(1) From the College for feed and bedding of College horses ; the filling of the College ice house ; a large quantity of milk (varying from 30 to 70 quarts a day), and potatoes, turnips, etc., for College use.

(2) From the Dairy Department for 176 tons ensilage, 700 bushels mangels, some turnips, and the year's supply of pasture, hay and straw for 30 cows, 10 to 12 calves and a number of swine.

(3) From the Poultry Department for straw, chaff, etc., some mangels, the hauling of stone for foundations of buildings, and two or three days of man and team grading around the same.

(4) From the Experimental Department for the feed and bedding of four horses throughout the year, and for the clearing and cleaning of several acres of new land.

(5) From the Horticultural Department for feed and bedding of two horses throughout the year.

It is also right to add in this connection, that the farm proper keeps a number of male animals—bulls, rams and boars—solely for educational purposes. Twenty-three or more of these animals are fed and cared for from year to year at large expense, when three would serve all the requirements of the farm superintendent for breeding. This is a large item of expense which the farm superintendent has to incur every year for the benefit of the College—that the students may have the means of getting a thoroughly practical knowledge of live stock, that they may have both male and female of all the principal breeds of farm animals for daily inspection and class-room work.

The Horticultural Department is also entitled to credit for a regular supply of fruit, vegetables, and flowers to the College throughout the year, and a large amount of work of man and team in grading and hauling sod and gravel for Dairy and Poultry Departments.

JAMES MILLS,
President.

APPENDIX VI.

MEETINGS OF FARMERS' INSTITUTES.

1895.

Division I.

Jno. McMillan, M.P., Seaforth, Ont. : "Cultivation of Corn," "Preparing Corn for the Silo," "Cultivation of the Soil for Roots or Grain Crops," "Farmers' Institutes," "Underdraining," "Care of the Manure Heap," "How to Apply Manure to the Land," "Breeding, Feeding and Exporting Beef Cattle to Britain," "The Benefits of Dehorning," "The Breeding and Care of Heavy Draught Horses," "Farm Implements," "Make Home Attractive," "Why Boys Leave the Farm."

Alex. E. Wark, Wanstead, Ont. : "How to Manage a Dairy Farm in Ontario and Make it Pay," "Vital Points to be Observed, Particularly in Supplying Dairy Goods to the English Market," "Pioneer *versus* Modern Life on the Farm."

D. W. Beadle, Toronto : "The Apple Orchard," "The Pear Orchard," "The Plum Orchard," "The Vineyard," and *any* of the *small fruits*, as the Strawberry, Raspberry and Blackberry, etc., including location, soil, preparation of ground, planting, pruning, cultivation, varieties, gathering, packing, marketing, injurious insects and how to destroy them, destructive fungi and how to prevent their injuries. "Elements of Success in Fruit Growing," "The Ideal Farmer," "Importance of Knowing the Life-Story of Our Insect Foes," "Some Interesting Facts in the Modes of Development of the Harmful Fungi."

1. Drayton	W. Wellington	Jan.	2nd,	1.30 p.m.
2. Clifford	W. Wellington	"	3rd,	1.00 p.m.
3. Paisley	C. Bruce	"	4th,	10.00 a.m.
4. Port Elgin	N. Bruce	"	5th,	10.00 a.m.
5. Tara	N. Bruce	"	8th,	10.00 a.m.
6. Durham	S. Grey	"	9th,	10.00 a.m.
7. Ayton	S. Grey	"	10th,	1.00 p.m.
8. Kenilworth	E. Wellington	"	11th,	1.00 p.m.
9. Damascus	E. Wellington	"	12th,	10.00 a.m.
10. Teeswater	S. Bruce	"	14th,	1.00 p.m.
11. Holyrood	S. Bruce	"	15th,	10.00 a.m.
12. Ripley	C. Bruce	"	16th,	1.00 p.m.
13. Wingham	W. Huron	"	17th,	10.00 a.m.
14. Brussels	E. Huron	"	18th,	10.00 a.m.
15. Atwood	N. Perth	"	19th,	10.00 a.m.
16. Milverton	N. Perth	"	21st,	1.00 p.m.

Division II.

Wm. Rennie, O.A.C., Guelph, Ont. : "Clover Culture," "Culture of Field Roots," "Rotation of Crops," "Ridding the Land of Weeds," "Stock Feeding," "Beautifying the Farm."

A. McNeill, Windsor, Ont. : "The Advantages of Spraying Fruit Trees," "Fruit Growing on the Farm," "When, Where and How to Plant Fruit Trees or Bushes," "When and How to Sell Fruit," "Underdraining," "Production, Care and Application of Manure," "Book-keeping for Farmers," "The Farmer's Library."

(†) Jas. G. Munro, Embro, Ont., representing the Good Roads Association of Ontario: "The Road Question in all its Bearings;" also "Mixed Farming," "Dehorning," "Bee-keeping on the Farm," "Poultry on the Farm," "Farm Life."

(*) Isaac Usher, Thorold, Ont (alternate with Mr. Munro), representing the Good Roads Association of Ontario: "How Roads Should be Constructed," "How Best to Maintain Them." He will also speak on "Concrete Walls," "How to Build Them," "The Cost of Same," "Concrete Floors, Troughs, etc.," "The Proper Ventilation of Stables," and other topics connected with farm buildings.

*1. Galt	S. Waterloo	Jan.	2nd, 10.00 a.m.
*2. New Hamburg	S. Waterloo	"	3rd, 1.00 p.m.
*3. Mitchell	S Perth	"	4th and 5th, 1.00 p.m. on 4th.
*4. Brucefield	S. Huron	"	8th, 10.00 a.m.
*5. Exeter	S. Huron	"	9th, 10.00 a.m.
*6. Parkhill	N. Middlesex	"	10th, 10 00 a.m.
†7. Thedford	E. Lambton	"	11th, 10.00 a m.
†8. Camlachie	E. Lambton	"	12th, 1.00 p.m.
†9. Brigden	W. Lambton	"	14th and 15th, 10.00 a.m. on 14th,
†10. Appin	W. Middlesex	"	16th, 10 00 a.m.
†11. Mount Brydges	W. Middlesex	"	17th, 10 00 a m.
†12. Byron	E. Middlesex	"	18th, 1.00 p.m.
†13. Coldstream	E. Middlesex	"	19th, 1.00 p.m.
†14. Ilderton	N. Middlesex	"	21st, 1 00 p.m.

Division III.

Prof. J. H. Reed, Guelph, Ont.: "Breeding Horses for Profit," "The Common Diseases of the Stomach of the Ox," "The Laws of Breeding," "The Care of the Horse," "The Points of the Horse," "The Education of the Horse," "Contagious Diseases, their Causes and Prevention."

A. H. Pettit, Grimsby, Ont.: "The Advantage of Cold Storage to the Fruit Growers," "The Varieties of Fruit to Plant," "Fruit Growing as a Business," "Fruit Growing on the Farm," "The Advantages of Spraying Fruit Trees."

Wm. Dickson, Atwood, Ont., representing the Good Roads Association of Ontario: "How Roads Should be Constructed," "How Best to Maintain Them, etc."; also on "Rotation of Farm Crops," "Dairy Farming in Connection with Cheese Production," "Tree Planting."

1. Waterford	N. Norfolk	Jan.	2nd, 10.00 a.m.
2. Port Rowan	S. Norfolk	"	3rd, 1.00 p.m.
3. Vittoria	S. Norfolk	"	4th, 1.00 p m.
4. Delhi	N. Norfolk	"	5th, 1.00 p.m.
5. Norwich	S. Oxford	"	8th, 10.00 a.m.
6. Mount Elgin	S. Oxford	"	9th, 10.00 a.m.
7. Aylmer	E. Elgin	"	10th and 11th, 1.00 p.m. on 10th.
8. Shedden	W. Elgin	"	12th, 1.00 p.m.
9. Rodney	W. Elgin	"	14th, 10.00 a.m.
10. Blenheim	E Kent	"	15th, 1.00 p.m.
11. Merlin	W. Kent	"	16th, 1.00 p.m.
12. Amherstburg	S Essex	"	17th, 10 00 a.m.
13. Belle River	N. Essex	"	18th, 1 00 p.m.
14. Stony Point	N. Essex	"	19th, 1.00 p.m.
15 Chatham	W. Kent	"	21st, 1 00 p.m.
16. Thamesville	E. Kent	"	22nd, 10.00 a.m.

Division IV.

Prof. J. H. Panton, O A.C., Guelph, Ont.: "Plants and Their Effect upon the Soil," "Spraying, its Objects and Results," "Nitrogen in Agriculture," "Insects and How to Destroy Them," "Parasitic Plants and How to Overcome Them," "Agricultural Science for Rural Schools," "The Sun in Relation to Life," "The Origin of Ontario Soil."

Thomas McMillan, Seaforth, Ont.: "Farming as an Occupation," "Making Our Way in Life," "Corn-Growing and the Silo," "Breeding and Feeding Cattle," "Cultivation of the Soil."

W. W. Hilborn, Leamington, Ont.: "The Farmer's Garden, How to Make it Pay," "What Fruits to Grow on the Farm and How to Grow Them," "The New Experiment Stations—Will They Benefit the Farmer? How?" "House Plants, How to Grow and Care for Them," "How Farmers' Horses Should be Fed."

1. Freelton	N. Wentworth	Jan.	2nd, 10.00 a.m.
2. Waterdown	N. Wentworth	"	3rd, 1.00 p.m.
3. Jordan	Lincoln	"	4th and 5th, 1.00 p.m. on 4th.
4. Niagara Falls South	Welland	"	7th, 10.00 a.m.
5. Crowland	Welland	"	8th, 10 00 a.m.
6. Pelham Town Hall	Monck	"	9th, 10.00 a.m.
7. Attercliffe Station	Monck	"	10th, 10.00 a.m.
8. Fisherville	Haldimand	"	11th and 12th, 1.00 p.m. on 11th.
9. Glanford	S. Wentworth	"	14th, 10.00 a.m.
10. Binbrook	S. Wentworth	"	15th, 10.00 a.m.
11. Brantford	S. Brant	"	16th and 17th, 1 00 p.m. on 16th.
12. St. George	N. Brant	"	18th and 19th, 1.00 p.m. on 18th.

Division V.

T. G. Raynor, B.S.A., Rose Hall, Ont.: "Tillage," "Selection and Breeding of Animals," "Selection and Management of a Dairy Herd," "Swine Breeding and Feeding," "Our Fodder Crops," "Drainage."

Joseph Yuill, Carleton Place, Ont.: "Fodder Corn and the Silo," "Care and Management of Dairy Cattle," "Winter Dairying," "Points of a Dairy Cow," "Care and Application of Manure," "How to Enrich an Impoverished Farm," "Sheep Husbandry," "Underdraining," "Swine Breeding," "Butter-making," "What Shall we Teach Our Sons and Daughters?"

(*) A. W. Campbell, C.E., St. Thomas, Ont., representing the Good Roads Association of Ontario: "How Roads Should be Constructed." "How Best to Maintain Them, etc.," "Draining Land."

(†) James Sheppard, Queenston, Ont. (alternate with A. W. Campbell), representing the Good Roads Association of Ontario: "How Roads Should be Constructed," "How Best to Maintain Them, etc."; also on "Drainage—When, Where and How it Should be Done," "Fruit Growing for Profit," "Fruit Growing on the Farm," "Spraying," "The Most Profitable Varieties of Fruit to Plant," "Care of an Orchard, etc."

*1. Embro	N. Oxford	Jan.	2nd, 10.00 a.m.
*2. Innerkip	N. Oxford	"	3rd, 10.00 a.m.
*3. Elmira	N. Waterloo	"	4th and 5th, 1.00 p.m. on 4th.
†4. Alma	C. Wellington	"	8th, 10 00 a.m.
†5. Erin	C. Wellington	"	9th, 10 00 a.m.
†6. Orangeville	Dufferin	"	10th, 10 30 a.m.
†7. Shelburne	Dufferin	"	11th, 1.00 p.m.
†8. Flesherton	C. Grey	"	12th, 1.00 p.m.
†9. Owen Sound	N. Grey	"	14th, 10.30 a.m.

†10. Palermo	Halton	"	15th, 1.00 p.m.
†11. Acton	Halton	"	16th, 10.30 a.m.
†12. Guelph	S. Wellington	"	17th and 18th, 1.00 p.m. on 17th.
13. Brampton	Peel	"	21st and 22nd, 1.00 p.m. on 21st.

Division VI.

Prof. Geo. Harcourt, B.S.A., St. Ann's, Ont.: "Winter Dairying," "Butter-Making," "Care and Handling of Milk," "Fodder Corn and the Silo," "Stock Breeding and Feeding," "Fruit on the Farm," "Agricultural Education."

Robert Thompson, St. Catharines, Ont.: "Gathering and Marketing Fruit," "Cultivation of Plums, Berries, etc.," "Cultivation of Corn and Peas," "The Cultivation of Roots," "Swine Breeding and Feeding," "Country *vs.* City Life.

Simpson Rennie, Milliken, Ont.: "Underdraining," "Destruction of Weeds," "The Cultivation of Grain and Root Fields," "Cattle Feeding for the British Market," "Should Agriculture be Taught in Public Schools."

1. Weston	W. York	Jan.	2nd, 10.00 a.m.
2. Woodbridge	W. York	"	3rd, 10.00 a.m.
3. Bond Head	S. Simcoe	"	4th, 1.00 p.m.
4. Thornton	S. Simcoe	"	5th, 1 00 p.m.
5. Minesing	C. Simcoe	"	8th, 10.00 a.m.
6. Wyevale	C. Simcoe	"	9th, 1.00 p m.
7. Coldwater	E. Simcoe	"	10th, 10 00 a m.
8. Orillia	E. Simcoe	"	11th, 10.00 a.m.
9. Meaford	N. Grey	"	12th, 1.00 p.m.
10. Thornbury	C. Grey	"	14th, 10.00 a m.
11. Collingwood	W. Simcoe	"	15th, 10.00 a.m.
12. Stayner	W. Simcoe	"	16th, 10.00 a.m.
13. Mount Albert	N. York	"	18th and 19th, 1.00 p.m. on 18th.

Division VII.

C. A. Zavitz, B.S.A., O.A.C., Guelph, Ont.: "The Best Varieties of Barley, Wheat, Peas and Oats," "Experiments in Growing Roots and Potatoes," "The Value of Clover," "Succulent Food for Live Stock," "Agricultural Experiments," "The Ontario Agricultural College."

D. E. Smith, B.A., Brampton, Ont.: "The Feeding of Dairy Cattle," "Ensilage and the Silo," "Butter-Making," "The Points and Characteristics of the Dairy Cow," "Essentials in Successful Breeding," "City *vs.* Country Life as an Educator," "How Law, Learning and Labor Affect the Farmer."

J. F. Beam, Black Creek, Ont.: "How to construct and Maintain Roads," "The Care of an Orchard," "The Culture of Small Fruits," "Dairy Farming as a Business," "Dehorning," "Stables," "Winter Care of Live Stock."

1. Oshawa	S. Ontario	Jan.	2nd, 10.00 a.m.
2. Pickering	S. Ontario	"	3rd, 10.00 a.m.
3. Agincourt	E. York	"	4th and 5th, 1.00 p.m. on 4th.
4. Uxbridge	N. Ontario	"	8th, 10.00 a.m.
5. Woodville	W. Victoria	"	9th, 10.00 a.m.
6. Beaverton	N. Ontario	"	10th, 10.00 a.m.
7. Lindsay	W. Victoria	"	11th, 10.00 a.m.
8. Fenelon Falls	E. Victoria	"	12th, 10.30 a.m.
9. Bobcaygeon	E. Victoria	"	14th, 10.30 a.m.
10. Peterborough	W. Peterborough	"	16th, 1.00 p.m.
11. Lakefield	W. Peterborough	"	17th, 10.00 a.m.
12. Keene	E. Peterborough	"	18th, 10.30 a.m.
13. Norwood	E. Peterborough	"	19th, 10 00 a.m.
14. Warkworth	E. Northumberland	"	21st and 22nd, 1.00 p.m. on 21st.

DIVISION VIII.

H. L. HUTT, B.S.A., O.A.C., Guelph, Ont: "The Proper Management of an Orchard," "The Farmer's Fruit Garden," "The Farmer's Vegetable Garden," "Farming as an Occupation," "Window Gardening."

I. W. STEINHOFF. Sebringville. Ont.: "Selecting, Breeding and Feeding Cows," "How Dairying Benefits the Farm," "Co-Operative Dairying a Necessity," "The Babcock Milk Tester," "Butter-Making on the Farm and in the Factory."

J. C. JUDD, Morton, Ont.: Representing the Good Roads Association of Ontario, "How Roads should be constructed," "How Best to Maintain Them, etc.;" also on "An Agricultural Problem; How shall we Keep the Boys and Girls on the Farm?"

1.	Blackstock	W. Durham	Jan.	2nd, 10 00 a.m.
2.	Tweed	E. Hastings	"	3rd, 1.00 p.m.
3.	Tamworth	Addington	"	4th, 10.00 a.m.
4.	Centreville	Addington	"	5th, 10.30 a.m.
5.	Napanee	Lennox	"	8th, 10.30 a.m.
6.	Stella	Lennox	"	from 1.30 p.m. on 9th till noon of 10th.
7.	Shannonville	E. Hastings	"	10th, meeting at 7.30 p.m. and 11th till 4.45 p.m.
8.	Wellington	Prince Edward	"	12th, 10 00 a.m.
9.	Demorestville	Prince Edward	"	14th, 10.30 a.m.
10.	Grafton	W. Northumberland	"	15th, 1.30 p.m.
11.	Coldsprings	W. Northumberland	"	16th, 10 30 a.m.
12.	Orono	W. Durham	"	17th, 10 00 a.m.
13.	Bowmanville	W. Durham	"	18th, 10.00.

DIVISION IX.

G. E. DAY, O.A.C., Guelph, Ont.: "Selection in Stock Breeding," "Summer and Winter Management of Dairy Cattle," "The Brood Sow and Her Litter," "Foods and Feeding," "Corn and the Silo," "Draining," "Bacteria and Their Products," "Difficulties in Butter-Making."

L PATTON, Oxford Mills, Ont.: "Breeding, Feeding and Handling Dairy Cattle," "Paying for Milk at Cheese Factories According to Butter-Fat," "The Future of Dairying in Ontario," "Thoroughness Essential to Success on the Farm," "How to Preserve the Fertility of the Soil," "The Value to the Farmer of Experiments Conducted at Experiment Stations," "How to Make Farm Life Attractive," "The Education of Farmers' Sons and Daughters."

MUNGO MCNABB, Cowal, Ont.: "Essentials in Farming," "Breeding and Feeding Beef Cattle," "Selection and Breeding of Sheep," "Care and Management of Sheep," "Underdraining," "Corn as a Crop," "Management of Pigs," "The Successful Farmer."

1.	Oxford Mills	N. Grenville	Jan.	2nd, 10.00 a.m.
2.	Kemptville	N. Grenville	"	3rd, 10.30 a.m.
3.	Winchester	Dundas	"	4th and 5th, 1 30 p.m. on 4th.
4.	Newington	Stormont	"	8th and 9th, 1.30 p.m. on 8th.
5.	Cornwall Centre	Cornwall	"	10th and 11th, 1.30 p.m. on 10th.
6.	Spencerville	S. Grenville	"	12th, 10.30 a.m.
7.	North Augusta	S. Grenville	"	14th, 10.00 a.m.
8	New Dublin	Brockville	"	15th, 10.30 a.m.
9.	Athens	Brockville	"	16th, 10 30 a.m.
10.	Delta	S. Leeds	"	17th, 10.30 a.m.
11.	Lansdowne	S. Leeds	"	18th and 19th, from 2 p.m. on 18th till 5 p.m. on 19th.
12.	Sunbury	Frontenac	"	21st, 10.30 a.m.
13.	Sydenham	Frontenac	"	22nd, 10.30 a.m.

Division X.

Prof. A. E. Shuttleworth, O.A.C., Guelph, Ont.: "Muck and Marl," "The Most Profitable Varieties of Farm Crops, which have been determined by Co-operative Field Experiments," "Milk, Cheese and Whey," "Composition and Cultivation of Roots," "Maintaining Soil Fertility," "Warming and Ventilating Habitations."

Wm. S. Fraser, Bradford, Ont.: "Swine Breeding and Feeding," "Sheep Breeding and Feeding," "Clover Growing and Curing," "Cultivation of Corn and the Silo," "Underdraining," "Butter-Making on the Farm," "The Farmer's Needs."

P. Mahon, Aberfoyle, Ont, representing the Good Roads Association of Ontario: "How Roads Should be Constructed," "How Best to Maintain Them," etc.; also on "Growing Rape and Feeding Lambs," "Town *vs.* Country Life," "Growing Corn and Making Ensilage.

1.	Lancaster	Glengarry	Jan.	2nd, 10.00 a.m.
2.	Vankleek Hill	Prescott	"	3rd and 4th, 1 p.m. on 3rd.
3.	Maxville	Glengarry	"	5th, 10.00 a.m.
4.	Duncanville	Russell	"	8th and 9th, 1 p.m. on 8th.
5.	Stittsville	Carleton	"	10th, 1.00 p.m.
6.	Carp	Carleton	"	11th, 10.00 a.m.
7.	Almonte	N. Lanark	"	12th, 1.00 p.m.
8.	Pembroke	N. Renfrew	"	14th, 10.00 a.m.
9.	Micksburg	N. Renfrew	"	15th, 1.00 p.m.
10.	Renfrew	S. Renfrew	"	16th and 17th, 10.00 a.m. on 16th.
11.	Smith's Falls	S. Lanark	"	18th, 10.00 a.m.
12.	Perth	S. Lanark	"	19th, 10.00 a.m.
13.	Lanark	N. Lanark	"	21st, 1.00 p.m.

Division XI.

R. F. Holtermann, Brantford, Ont.: "Bee-Keeping on the Farm," "Points Essential to Successful Bee-Keeping," "Bees in Relation to Horticulture and Plant Life," "The Honey Bee—Points Interesting and Instructive," "The Proper Care of Poultry on the Farm."

Thos. H. Mason, Straffordville, Ont.: "Hog Raising," "The Home Dairy," "Butter-Making," "The Care and Food of a Dairy Cow," "How to Select a Dairy Herd," "The Outlook for the Ontario Farmer."

1.	Bracebridge	Muskoka	Jan.	29th, 10.00 a.m.
2.	Port Carling	Muskoka	"	30th, 1.00 p.m.
3.	Utterson	Muskoka	"	31st, 1.00 p.m.
4.	Emsdale	E. Parry Sound	Feb.	1st, 10.00 a.m.
5.	Edgington	W. Parry Sound	"	2nd.
6.	Trout Lake	W. Parry Sound	"	4th, 1.00 p.m.
7.	Parry Sound	W. Parry Sound	"	5th, 1.00 p.m.
8.	Hurdville	W. Parry Sound	"	6th, 1.00 p.m.
9.	Broadbent	W. Parry Sound	"	7th, 1.00 p.m.
10.	McKellar	W. Parry Sound	"	8th, 1.00 p.m.
11.	Dunchurch	W. Parry Sound	"	9th, 1.00 p.m.
12.	Magnetawan	E. Parry Sound	"	11th, 1.00 p.m.
13.	Burk's Falls	E. Parry Sound	"	12th, 1.00 p.m.
14.	Sundridge	E. Parry Sound	"	13th, 1.00 p.m.
15.	South River	E. Parry Sound	"	14th, 10.00 a.m.
16.	Powassan	E. Parry Sound	"	15th, 10.00 a.m.

Division XII.

J. B. Muir, North Bruce, Ont.: "Raising Hogs for Market," "First Steps in Dairying," "Butter-Making in the Home Dairy," "The Care and Food of a Dairy Cow," "How to Select a Dairy Herd," "How to Make Life Pleasant on the Farm."

Alfred Brown, Bethel, Ont.: "Special Farming," "Sheep Husbandry," "Saving Manure," "The Farmer's Fruit and Vegetable Garden," "The Proper Care of Poultry on the Farm," "How to Give our Sons and Daughters a Business Education at Home."

1. East Korah School	C. Algoma	Jan.	23rd,	2.00 p.m.
2. Base Line School	C. Algoma	"	23rd,	7.00 p.m.
3. Maclennan	E. Algoma	"	24th,	1 00 p.m.
4. Richard's Landing	St. Joseph Island	"	25th,	10 00 a m.
5. Marksville	St. Joseph Island	"	26th,	1.00 p.m.
6. Tenby Bay	St. Joseph Island	"	28th,	1.00 p.m.
7. Bruce Mines	E. Algoma	"	29th	1.00 p.m.
8. Thessalon	E. Algoma	"	30th,	1.00 p.m.
9. Iron Bridge	E. Algoma	"	31st,	1.00 p.m.

10. Manitoulin Island, Gore Bay, Manitowaning, Little Current and other points, Feb. 2, 4, 5, 6, 7 and 8th. Delegates to arrive at Gore Bay at 1 p.m. on the 2nd.

APPENDIX VII.

SIXTEENTH ANNUAL REPORT

OF THE

ONTARIO AGRICULTURAL AND EXPERIMENTAL UNION.

The sixteenth annual meeting of the Ontario Agricultural and Experimental Union was held at the Agricultural College, Guelph, on the 18th and 19th of December, 1894, commencing at 10 a.m. on the 18th.

The President, Mr. A. Shantz, occupied the chair.

The minutes of last meeting were on motion taken as read and passed.

REPORT OF COMMITTEES.

Mr. R. F. Holtermann : Mr. Lick and myself had an interview with the Hon. Mr. Dryden, Minister of Agriculture, and requested an additional grant. We were very favorably received, and as a result we have an additional $50 grant to the Union.

GENERAL BUSINESS.

Mr. R. F. Holtermann : The Executive Committee have for some time thought it advisable to have a little change in the by-laws. The Executive has to consult with the President of the Agricultural College ; you will see the necessity of this, because the meetings are all held at the College and interfere, more or less, with the working of the Institution, and we think it advisable to make an amendment to Article II., and make it read as follows :

"The Executive Council shall consist of the President of the College, Hon. President, Vice President, Secretary, Treasurer and Editor."

Therefore, I move that Section II. be amended accordingly.

This motion, after being seconded, was passed by the meeting.

Mr. R. F. Holtermann : It would be well to discuss if we do require an increased grant, and if so what will be done about it.

The President : The grant we get at present is a liberal one, of course, but we can extend our work if we have more funds to do it with, and I think it would be quite proper to ask for an increase.

Mr Zavitz : The Treasurer is not here yet, and I don't know exactly how our funds stand. I know that in our line of agricultural experiments if we had more money we could do more work. We have done a large amount of work this year, much more than last year, because we had more money to do it with. We used up every cent we received, and I think used it well, and we certainly extended our work. If we can get an increased grant we will be able to do more work. I believe we are carrying on experimental work along five lines: Agriculture, Bee-Keeping, Horticulture, Dairying, and Botany and Entomology. If we are going to extend this work along all these lines, it will require more money than we receive now.

Mr. R. F. Holtermann: I may say the Bee-Keeping Committee have spent a little more than the $25 grant. We spent the $25 in material. We have had some of the best men in the province taking part, and our work has been limited by lack of funds.

Mr. Lick: There are three or four features in connection with this. One is that these are hard times. If we, as an Experimental Union, are doing good work for the farmers of this county, and if that can be shown, I believe we may reasonably ask for almost any grant and we can get it.

Mr. Monteith: I think with Mr. Lick that usefulness should be the test that we should go by. I think the Experimental Union is beyond experiment, and I think we are quite within the bounds in asking for an increased grant. The work has extended immensely.

PRESIDENT'S ADDRESS.

The President, Mr. A. Shantz, then delivered the annual address:

Gentlemen,—We are again met in the capacity of the Agricultural and Experimental Union at this, the sixteenth annual meeting, to discuss the problems that are agitating the minds of the farmers of our province. Our aim in holding these meetings is to form a bond of union amongst the officers of this institution, the students, ex-students and visiting friends, and also to report in summarized form the results of our work during the year. The farmer friends who have attended these meetings in the past have always been courteously received, and I am sure in the future they will be similarly received. They have been a great help to us, and we warmly welcome them to participate in the proceedings and to profit thereby. The programme certainly is a mental "bill of fare" that will be of benefit to all interested in the tilling of mother earth.

A great many of our neighbors have not had the privilege of knowing what our Union has done or what it is for,—in fact, some are not aware there is such an organization in existence. Now, it has occurred to me, that while the depression in agriculture lasts, when men following that calling are seeking after more knowledge so that they may be enabled to make an honest living and to become worthier citizens, would not this be a grand opportunity to elighten them in regard to the work and usefulness of this Union? It behooves us jointly and individually to do all that lies in our power to help along this work. In order that we may accomplish the most as a body, we should have on our membership list the name of every student and ex-student. It is a deplorable reality that there have been so few names on our list during the past year, and I appeal to you who are eligible to become members, and who have the popularity of the O. A. C., the usefulness of our Union, and the prosperity or our farming community at heart, to register your names before the termination of this meeting.

The Minister of Agriculture has placed at our disposal this year the sum of $700—the largest amount that has ever been granted us. The Government can rest assured that whatever amount they place in our hands will be wisely spent. For the extension of our work we need still more. But since the value of all experimentation depends so much upon the exactness and accuracy with which the experiments have been conducted, we should not only aim to widen our field but also strive to be more thorough. Let us be more scientific. In the spring of 1886 the Association launched out upon the present plan of experimentation with, I think, twelve experimenters. Since then the work has steadily increased, and during the last three years it has gone forth with tremendous strides, insomuch that in 1891 there were 2,642 plots, while the past season there were upwards of 7,721 plots used for these co-operative tests over Ontario. In live stock experiments we have done nothing as yet. A few years ago a committee considered the advisability of undertaking such experiments, but the difficulties in the way at that time seemed to them insurmountable. Whether or not we shall ever be able to carry out experiments along that line I shall not conjecture. Our Union is as yet only in its infancy. Who can predict the work it may yet accomplish? Besides the experiments in agriculture we have experiments in apiculture, in horticulture and in dairying, all important branches of this great industry which has so often been termed "the back-bone of our country."

And now, in conclusion, let me urge upon you the necessity of your hearty co-operation in this work. The old adage "In union is strength" may be fittingly applied here. Let us then stand shoulder to shoulder marching in unison towards the goal ahead, and success will be ours.

I thank you, the members of the Experimental Union, for having elected me to this honorary office, and hope that in years to come this Union may achieve what has been undreamt of in the past.

REPORT OF EXPERIMENTS IN APICULTURE.

The Self-Hiver.

It will perhaps be remembered that it was the intention of the Apicultural Committee to test for a second season the improved Pratt Self-Hiver. Last season it was found that this instrument, by means of which the bees hived themselves, worked with success as far as hiving the bees in the process of swarming was concerned. It was, however, found that the bees were inclined to enter and take possession of the new hive underneath before swarming. This, whilst doing no harm in the production of extracted honey, was a disadvantage in the production of comb honey, it giving the product in a form different to the one desired by the bee-keeper. The evidence this year confirms last season's experience. For those having only a few colonies of bees, unable to watch for swarms or perhaps finding it difficult to hive them, the Self-Hiver would appear to be a useful invention. For the bee-keeper who *carefully* watches his bees during the swarming season, the above objections and the expense of additional hives would appear to take it outside the range of practical apiculture.

Five-Banded Bees.

Within the last few years what are known as five-banded Italian bees have come into very general notice. Your committee thought that owing to the great attention they were attracting it would be well to make a general test of these bees. Their longevity, hardihood, honey-gathering qualities and temperament are to be noted by those taking the work in hand. Several leather-colored queens were also supplied for the same purpose. In every case the leather-colored Italians were introduced safely, and went into winter quarters in good condition. Already two of the five-banded Italian queens were lost before safely introducing, two were since lost by superseding, and fourteen queens have gone into winter quarters. Wm. Couse, Streetsville; Thos. Dryden, Paisley; A. Pickett, Nassagaweya; E. M. Husband, Cairngorm; John Myers, Stratford; C. W. Post, Murray; R. H. Smith, St. Thomas; Wm. McEvoy, Woodburn; Alpine McGregor, Inglewood; W. J. Brown, Chard; Goold, Shapley & Muir Co. (Ltd.), R. F. Holtermann, Brantford; F. A. Gemmell, Stratford; F. A. Rose, Balmoral; M. B. Holmes, Athens, and S. T. Pettit, Belmont, were supplied with queens. From this it will be seen that some very thorough work may be expected. The queens were supplied too late to breed a full stock of bees for the 1894 honey flow, but a very full report may be expected covering the year 1895.

Respectfully submitted,

R. F. Holtermann.

QUESTION DRAWER.

Q. Would it pay the average farmer in Ontario to keep bees?

Mr. MONTEITH: In answer to that query, I think it is an open question as to whether it will pay the average farmer. I have found in my experience that it is unwise to have too many irons in the fire. The swarming season usually occurs at a very busy season of the year, and the matter is overlooked and swarms very often are lost. As far as my own experience is concerned the honey has been a source of pleasure to us during the year. But at the present price of honey I do not think bee-keeping would be profitable to the average farmer.

Mr. C. A. KEIL, Chatham: I generally keep three or four hives. I do not keep them for profit nor do I know much about them; but they always furnish us with plenty of honey, and we generally sell a couple of dollars worth, and it is not very much trouble.

Mr. HOLTERMANN: I believe we very often direct our attention and energies to too many things. I think it is a question of what irons in the fire are the best; bee-keeping may be one of those and it may not. The district you are in has something to do with it, and the interest which you naturally have in the subject; some of us are naturally adapted to certain kinds of work. When I lived on the farm I took a great interest in insects, and I believe my taste ran along that line. There were difficulties in connection with swarming. I believe those difficulties have been overcome by the self-hiver. The time required in connection with bee-keeping is not much. There are often members of the house who are anxious to earn a little money; it adds to the interest they take in the farm, and keeping a few colonies of bees on the farm is an advantage. Outside of the actual value of the honey the bee plays an important part in the fertilization of plant life; in fact I feel justified in saying that the primary object of their existence is to assist in the fertilization of flowers. Only recently it has been discovered that it was actually necessary to have a different variety of apple, for this reason, that the pollen which certain varieties of apples produced were not adapted to fertilize that blossom, and the pollen had to be obtained from another variety. Now the honey bee is certainly better adapted for this work than any other insect in our climate. The honey bee is not a native of our own country. In the wild state in the early spring there are very few blossoms, and the insects, though few in number, were sufficient to fertilize the flowers in that condition. But at the present time we have immense orchards all through the country and we need the honey bee to fertilize the blossoms. With other insects only the female survives, but in the honey bee, we have not alone the queen but we have ten or twenty thousand working bees which live through the winter with that queen, and as soon as the warm sunshine comes out in the spring they are flying, and of course assist in the fertilization of this plant life, and for that reason alone it would pay the farmer to have some bees in his own vicinity, if there is not an extensive bee-keeper in his neighborhood.

Q. What kind of winter storing would you recommend?

Mr HOLTERMANN: I try as much as possible to winter upon the natural store of the hive. Honey is worth wholesale say 8 cts. a pound. Granulated sugar is worth wholesale $4\frac{1}{2}$ cts., but by the time you have extracted your honey and sold it, and feed your bees with sugar syrup stores and if you calculate the expense of marketing the honey, there is a certain amount of loss in feeding sugar syrup stores. I believe it pays best to winter upon the natural honey store.

Q. Is it as economical to use pure-bred cows as it is to use grade cows for a dairy herd?

Mr. KENNY: I believe it is economical to use grade cows from the fact that they give you just as much produce and do not cost half as much money. I think that is a self evident fact.

Professor DEAN: There is so much difference in cows, you may get a good cow in a grade cow and she may be a better cow than the pure bred cow. I could agree with Mr. Kenny, for all practical purposes a good grade cow is the best thing for the dairy.

The CHAIRMAN: What are a few of the most important points you look at in selecting a cow?

Mr. KENNY: You may hit a thing nine times out of ten but you will be sure to miss sometimes. I have found from my experience that a great many promising heifers have proved to be poor milkers, and the weeding system has got to be the weight with us. We must weed out our herds, and keep those that prove most satisfactory at the milk-pail.

Professor DEAN: You may get a cow with all the fancy points and yet she may be a poor animal.

Q. Are there varieties of apples that fertilize themselves?

Mr. WOOLVERTON: That is not definitely settled yet with regard to the apples. A large list of grapes have been found that do not fertilize themselves; this list will be published in the next report of our Association. It was given us in a very interesting paper by Professor Beach, of Geneva, New York, Experiment Station. He showed us that there were many varieties of grapes of which the pollen, for some reason or other, does not fertilize itself, and consequently a large number of one variety by itself without other varieties near it would be unfruitful. That is a very important thing, and opens a vast field for study in the future, and explains why a great many people are unsuccessful in fruit growing.

REPORT OF THE COMMITTEE ON DAIRY EXPERIMENTS.

Although a committee on dairy experiments has been appointed for some time, it was not until this year that any work was done in this line. The following circular letter, together with blank forms for making the experiments, was sent to about 100 leading dairymen throughout the province:

GUELPH, April 2nd, 1894.

DEAR SIR,—The Committee on Dairy Experiments, appointed by the Ontario Agricultural and Experimental Union, desire your co-operation in regard to this experimental work in dairying. We feel that every dairyman, cheese-maker, and butter-maker should be an experimenter. To secure co-operative experiments on the same lines, we have selected the two enclosed for 1894, and hope that you may be able to undertake one or both of them during the year, and that you will send the results to us as soon as possible after the work is done.

The results of all the experiments will be published in the Annual Report of the Experimental Union which appears in the College Report of which a copy will be sent to each one who sends in a report to the Committee.

H. H. DEAN (Director)
H. L. BECKETT,
S. P. BROWN.
Committee.

Early in November a card was sent to each person, asking them to report to us not later than December 1st. Some said that owing to various reasons, such as lack of a tester, lack of proper vats, lack of time and help, they had been unable to do either of the experiments, while others admitted that if they had made an effort they might have done at least a part of one or the other.

The experiments sent to makers were also carried on at the dairy of the College.

There were five reported on each experiment, two men (Messrs. Roode and Muir) conducting a part of both experiments. I may specially mention the work done by Mr. Roode, of Hulbert, who had a special vat made for experimental work, and the thanks of the Committee are due him for his trouble. This work was done wholly at the expense of the experimenter, we supplying nothing but the blank forms to be filled in.

The object of experiment No. 1 was to observe the effect of an increase in the per cent. of fat in the whole milk on the yield and quality of cheese.

The following directions were sent with this experiment: "We would like, if possible, one experiment each month during the season. Secure as wide a range of the per cent. of fat in the milk as can be got. Not less than 300 pounds of milk should be used in each experiment. Try to make the cheese from poor and rich milk on the same day or on consecutive days of each month, and work them as nearly alike as possible."

The results of the dairy experiments and of the work done in the factories are seen in the table :

1894. Name of experimenter.	Month.	Average per cent. fat in milk.	Lb. milk.	Lb. fat.	Lb. cheese. Green.	Lb. cheese. Cured.	Lb. milk for lb. cheese. Green.	Lb. milk for lb. cheese. Cured.	Lb. cheese for lb. fat. Green.	Lb. cheese for lb. fat. Cured.	Average per cent. fat in whey.
	May	3.80	2,100	79.80	206.50	194.75	10.03	10 77	2.59	2.44	0 26
		3.48	2,100	73.08	191.75	183.25	10.78	11.46	2.68	2.51	0.25
	June	4.18	1,800	75.24	195.50	183.75	9.21	9.79	2.60	2.44	0.19
		3.60	1,800	64.80	181.25	170.00	9.95	10.59	2.80	2.62	0.19
	July	3.84	1,800	69.15	184.00	172.25	9.79	10.46	2.67	2.49	0.28
		3.23	1,800	58.05	164.25	154.50	10.97	11.66	2.83	2.67	0.27
O. A. C.	August...	3.93	1,800	70.80	178.50	169.00	10.10	10.68	2.53	2.59	0.26
Dairy		3.25	1,800	59.50	161.50	152.25	10.15	11.83	2.76	2.56	0.20
Department.	Sept.....	3.97	1,800	71.40	188.25	179.75	9.56	10.01	2.63	2.52	0.09
		3.03	1,800	54.60	161.25	152.75	11.16	11.80	2.95	2.79	0.15
Guelph.	Oct......	3.95	1,500	59.25	161.75	153.50	9.27	9.77	2.81	2 59	0.14
		3.56	1,500	53,40	150.75	142.50	9 95	10.52	2.82	2.68	0.14
	Nov.	3.88	1,800	69.90	190.00	183.25	9.47	9.82	2.72	2.62	0.14
		3.47	1,800	62.40	175.75	168.25	10.24	10.69	2.82	2.70	0.11
	Averages and totals	3.94	12,600	495.54	1,304.50	1,236.25	9.63	10.19	2.65	2.50	0.19
		3.37	12,600	425.83	1,189.50	1,123.50	10.60	11.22	2.81	2.65	0.18
	Diff......	0 57	0	69.71	115.00	112.75	.97	1.03	0.16	0.15	0.01
A. T. Bell, Tavistock.	Oct. 19 ..	4.70	500	23.50	59.25	57.00	8.44	8.77	2.52	2.42	0.30
		3.45	500	17.25	48.50	46.50	10.31	10.75	2.81	2.69	0.20
J. B. Muir, Avonbank.	Oct. 29 ..	4.00	5,338	213.52	584.00	568.00	9.14	9.40	2.73	2.66	0.20
		3.70	5,116	189.29	519.00	507.00	9.85	10.09	2.74	2.67	0.20
L. L. Phelps, Mt. Elgin,	May 24..	3.40	4,500	153.00	481.50	470.50	9.34	9.91	3.14	3.07	.....
		3.00	4,500	135.00	434.00	424.00	10.36	10.61	3.21	3.14	......
E. A. Roode, Hulbert, Dundas Co.	July 23-24	3.80	750	28.50	75.00	72.00	10.00	10.41	2.63	2.52	2.20
		3.20	750	24.00	70.00	66.00	10.71	11.34	2.92	2.75	0.20
	Aug. 1-2.	3.80	750	28.50	75.00	72.00	10.00	10.41	2.63	2.52	0.30
		3.60	750	27.00	72.50	70.00	10.34	10.71	2.08	2.59	0.30
	Sept. 6-7.	3.80	300	11.40	31.00	30.00	9.68	10.00	2.72	2.63	0.30
		3.20	300	9.60	28.00	27.00	10.71	11.11	2.91	2 81	0.40
	Oct. 9-10.	4.30	500	21.50	62.00	60.00	8.06	8.33	2.88	2.79	0.30
		3.80	500	19.00	56.00	53.50	8.93	9.35	2.95	2.81	0.30
Average of Mr. Roode's expm'ts.	Four months.	3.92	2,300	89.90	243.00	234.00	9.43	9.79	2 72	2.62	0 28
		3.45	2,300	79.60	226.50	216.50	10.17	10.63	2.87	2.74	0.30
	Diff.	0.47	0	10.30	16.50	17.50	.74	.84	.15	.12	0.02
*Wm. Dwyer, Chesterville, at the Gowan Brae factory.	Sept.10-11	4.50	1,350	60.75	150	147	..	9.32	......	2.42	0.40
		2.80	1,350	37.80	130	126	....	10.71	......	3.33	0.20

*In this experiment cream was added to get the richer milk and the partially skimmed milk used to secure the lower per cent. fat.

Conclusions from No. 1 Experiment.

1. An increased percentage of fat in the milk gives an increased yield of cheese, though not in exactly the same proportion.

2. That a pound of butter-fat in milk averaging 3.37 per cent. of fat will make more cheese than a pound of fat in milk averaging 3.94 per cent. of fat is shown by the results of the experiments at the dairy of the O. A. College, and all the other Canadian experiments quoted point in the same direction.

3. There is little difference in the per cent. of fat lost in whey whether the milk is rich or poor in fat, what difference there is being in favor of the whey from the poor milk.

The object of experiment No. 2 was to determine if composite samples of milk could be successfully tested with accurate results at the end of two or more weeks.

The directions were:

"Select one or more patron's milk and test samples every day. At the same time put a sample into the composite jar and test it at the end of the periods named. The same patrons need not be selected each month."

The subjoined details of the testing show that composite testing may be successfully practised for one month, but owing to the risk in case of breakage, souring, or other mishap, we would not recommend a longer period than two weeks at present.

Name of experimenter.	Month.	Patron No.	One week.		Two weeks.		Three weeks.		One month.	
			Average daily tests.	Per cent. fat in jar.	Average daily tests.	Per cent. fat in jar.	Average daily tests.	Per cent. fat in jar.	Average daily tests.	Per cent. fat in jar.
E. A. Roode, Hulbert, Ont., Dundas Co.	May	1	3.73	3.90	3.82	4.00	3.97	4.00	3.75	3.90
	June	1	3.766	3.90	3.70	3.70	3.70	3.50	3.68	3.60
	July	1	3.500	3.50	3.38	3.30	3.50	3.40	3.46	3.40
	August	1	3.375	3.40	3.387	3.20	3.372	3.30	3.42	3.40
	Sept.	1	3.460	3.50	3.66	3.70	3.460	3.60	3.60	3.80
	October	1	3.880	3.80	4.00	4.10	4.09	4.20	4.14	4.20
	Av. 6 months..	1	3.62	3.66	3.66	3.66	3.68	3.66	3.67	3.67
G. B. Brodie, Brantford, North Brant factory, Brant Co.	June	1	3.26	3.20	3.209	3.20	......	......	......	......
	July	1	3.66	3.70	3.66	3.60	3.745	3.6	3.698	3.50
		2	4.30	4.30	4.31	4.30	4.310	4.3	4.280	3.90
	Sept.	1	4.36	4.30	4.36	4.20	4.340	4.1	......	......
		2	4.32	4.00	4.16	4.30	4.130	4.0	4.19	4.1
	October	1	4.20	4.10	4.23	4.20	4.320	4.5	4.32	4.5
		2	3.10	3.00	3.18	3.10	3.320	3.4	3.337	3.4
	Av. 4 months..	....	3.89	3.80	3.87	3.85	4.03	3.98	3.965	3.88
J. B. Muir, Avonbank, Perth Co.	October	1	4.15	4.1	4.03	4.00	3.81	3.8	3.85	3.70
		2	3.93	3.9	3.99	3.80	3.90	4.0	3.95	3.80
		3	3.66	3.7	3.70	3.80	3.69	3.6	3.68	3.60
	Av. 1 month..	....	3.91	3.9	3.90	3.87	3.80	3.80	3.83	3.70
A. D. Perry, Harrowsmith, Frontenac Co.	July	1	3.50	3.40	3.80	3.60	3.45	3.55	......	3.60
		2	3.90	3.90	3.81	3.90	3.50	3.75	......	3.70
		3	3.62	3.60	3.81	3.70	3.80	3.75	......	3.75
	Av. 1 month..	....	3.67	3.63	3.80	3.73	3.58	3.68	......	3.68
Jas. A. Gray, Atwood, Perth Co.	May	1	3.62	3.55	3.20	3.20	3.80	3.40	3.32	3.40
O. A. C., dairy dept.	Av. for 8 mo's.	1	3.69	3.67	3.52	3.47	3.33	3.30	3.18	3.14
		2	3.44	3.45	3.21	3.12	3.10	3.09	3.09	3.17
	Average......	....	3.57	3.56	3.37	3.30	3.22	3.20	3.14	3.16

In conclusion we may say that there are many difficulties in the way of securing the co-operation of any large number of cheese or butter-makers in factories. During the summer when such work should be done, the amount of work on hand renders it difficult for makers to give the time necessary for experimental work. In winter when they have the time there is no milk for them to work with

Again, there is little inducement offered, beyond the satisfaction of knowing the results, and considerable expense and trouble are incurred. If we could arrange that experimenters should receive something to in part pay for the trouble it might be well. In the other departments, experimenters receive grains, roots, seeds, plants, etc., which in a measure repay them, while in the dairy there is nothing whatever, so far.

I would suggest that the co-operation of the dairy associations be asked in this work and a suitable number of experiments be decided upon jointly, and that the Dominion station be also asked to co-operate in such experiments as these joint committees shall decide upon.

All of which is respectfully submitted on behalf of the committee.

H. H. Dean.

CLOVER CULTURE.

By T. B. Terry, Hudson, Ohio.

The subject I am to talk on this afternoon is clover culture. I suppose that means really the treatment of clover, and the care of it, but I want to give a few moment's time before beginning on that, to inquire what we are growing clover for? what we are to gain by growing clover? and I must touch on these points very briefly. Because we can grow more hay to the acre than we can by growing timothy or any of the grasses, and when we get this clover hay it is worth more per ton to the farmer to feed. And then we are growing it largely to get fertility for our soil and to get it in the cheapest possible way. That is what we have been doing on our farm for a long time. How much fertility can we get by growing a crop of common red clover? About $57 worth of plant food per acre. That is at market rates of plant food in our commercial fertilizers That is about what we have been getting on our farm for some time. Let me explain that briefly. We sow the clover with the wheat in the early spring —on the wheat. We get a crop in the wheat stubble that fall that would make probably a ton to the acre on an average; of course in a dry year less and a wet year more. The next year we get a crop of hay that would make 2½ tons on an average. The second crop will make about one ton and a half, making in all, five tons of growth. The root growth would be about two tons to the acre, dry weight. So we have about seven tons altogether, in the ground and above the ground, and this is worth, as you know, about $8.20 per ton at the market rates of plant food. Seven tons at that rate amount to $57 per acre. This amount of fertility we are growing on our farm by growing clover. That is equal to about a ton and a half of high grade complete fertilizer per acre. Many of our farmers would think they were feeding their land very liberally if they put on a half ton. Now comes an important point. Where does this come from? Does it come from the soil directly? If so we will not be the gainers by growing clover, because we will simply be able to run our lands down faster. But we know now that it does not. Clover has the ability to get its nitrogen from the free nitrogen of the air. How much is there of that? Eighty per cent. of the air you are breathing is free nitrogen. On about an acre of your land there is $90,000 worth of nitrogen at market rates So if you have got 100 acres of land you are a millionaire. You cannot sell nitrogen, but you can get from the air for nothing not only for twenty years or for a lifetime, but for ever, all the nitrogen you want, to grow just as large crops of grain as can stand up on your land. Perhaps you will think that is a strong statement, but I believe just what I say. This is one of the most wonderful qualities that the clover plant has, and it has another which perhaps is almost as important. It sends its feeding roots deeply into the subsoil, and gathers up mineral matter and brings it up into the soil, pumps it up into the large tap roots and into the tops of the clover Mineral matter, that your grain and wheat cannot get hold of, clover can, and then when you have brought the two together—the nitrogen from the air and the mineral matter from the deep subsoil—you can make your soils just as rich as you want them for growing your many crops that follow the clover.

Now, of course there are many little points that might be brought up in regard to this collection of the mineral matter. For example, some land that I noticed this morning in coming here from Buffalo, would need drainage before the clover would do this work. This rolling land around Guelph perhaps does not, before the clover can go down into the subsoil and gather up this mineral matter. Did you ever notice how the clover plant grows? The large tap root goes right through the soil. It does not send out any fibrous roots, scarcely, in the soil. Just see how different it is from timothy, or wheat, or rye that you grow. In clover the tap root goes right down through the soil, and when it gets there, these little fibrous roots are sent out in the deep subsoil. They go down three, four and five, and I have traced them down eight feet deep. There they are gathering up this mineral matter and bringing it to the surface, and then when you plow that sod under you have the mineral matter brought up there. You may ask where this comes from. The mineral matter is continually working downwards. The clover steps in and pumps it to the surface again.

We went on a farm 25 years ago that was run down by careless farming until it would not produce a paying crop of anything. It was called worn out. Nine men out of ten would have told you that farm is worn out. Well, it was not worn out. You cannot wear out any land in one lifetime or one hundred years. It was run down simply by growing corn and oats and wheat and timothy, and practically selling everything off the farm. This had been going on for 60 or 70 years. The last corn crop grown on that land, before we owned it was the year before we went there. Very little of it got more than three feet high. I do not believe one bushel of corn was gathered from an acre. The best crop of wheat grown for three or four years was eight bushels to the acre. We began growing clover, not knowing anything like as much as we do now about what clover would do for us. We had to put all the manure on we had, to get the clover started. After we had the clover in for two years we found to our surprise we were getting good, fair crops, and it set us to thinking and the result was we used the clover more, and used all the manure we could to make a top dressing to get the clover started, and we found we could grow good crops after that, and that we could gradually increase the crops without any manure or fertilizers. Perhaps we could have built the land up faster if we had had some plant food, but we had no more manure and at that time very little commercial fertilizer was used in our vicinity. In 13 years from the time we began on that land in the condition I have told you of, we brought the fertility up to such a point that we got 35 bushels of wheat an acre on an average for five years.

About this time our State Board of Agriculture offered a $50 prize for the best farm of fifty acres in Ohio, and we got the $50 to our surprise, beginning on the worst run down farm in our locality. We have been growing clover in regular rotation ever since. This last year we had the largest crop of wheat we have ever grown. Perhaps I could best illustrate the point I want to bring out by comparing our yield with that of a neighbor's right over the fence in an adjoining field. This land of our neighbor's, originally, belonged to our farm. The land was all cleared by one man and farmed as one field for 50 years; finally it was sold. The character of the soil is exactly the same. I would as soon take one as the other. My neighbor has been following three year rotation something the same as we have for many years. I will just take the last three years to illustrate this point. Each of us had wheat on these two fields this year. The year before we each had potatoes. The year before we had clover on our field as large as we could make grow after 25 years' experience growing it. It was good every square foot. Where it was not good we made it good by top-dressing. It was clover alone—no timothy. My neighbor had timothy on his field that year with a little clover in it. If you went there and asked him what he grew he would say timothy and clover; but it was mostly timothy.

We cut our first crop for hay and so did our neighbor, and I presume he got as many tons to the acre as we did. He is one of the best farmers in our section. As clover is worth about one-third more to feed to stock than timothy, we were a little ahead of him. Our clover, cut when in bloom, grew right up rapidly and made a second growth, one I think that would have given us two tons to the acre if we had cut and cured it as hay. But we did not; we let it go back into the land to plow under for our potato crop the next year. Our neighbor had no second growth on his field to amount to anything, because timothy don't give a second crop. He keeps a dairy—quite a large one—and about this time he began hauling out manure from his stables and spreading on this timothy sod. He kept it up all winter. He put all the manure made from his whole farm on this one field. Of course you can see the object; it was to beat us. Here were the two fields side by side, and he wanted a better crop than we, and we were just as anxious to get a better crop than he had. The road runs right along so that parties can see these two fields side by side. When I went home in the spring and saw the amount of manure he was putting on that field, I thought he would beat me. Of course we could sit down and figure up that it would take about ten or twelve loads per acre to make that timothy seed equal to our clover seed with the second crop of clover sod plowed under, but he put on about twice that amount and of course there was a reasonable show for him to get the larger crop. By common consent we began planting our potatoes on the same day. This was in the spring of 1893. They were put in with the same kind of machinery. The cultivation all through the season was practically the same, and it was just as good as we could give on both farms. When it came to digging time we were a little ahead of our neighbor. I do not say this to brag at all, but to illustrate this point of the value of clover. We had more bushels and more dollars to the acre than our neighbor. He said you have beaten me on the potatoes but I will have the largest wheat crop. It has been too dry for my potatoes to get the benefit of that manure, but the wheat will get it. Well I naturally thought he would beat me on the wheat. We put in our wheat at the same time, and prepared our land in the same way. The wheat was taken from the same bin—some we had saved purposely for seed. It was graded in the same machine as perfectly as possible, only sowing the very best grains. I recognized the fact that we had a foundation there for the largest crop of wheat that would grow. The land was well drained. We gave it the best of tillage and the best of seed. I drilled that wheat myself. The last week in March last spring, I got home from my institute work for good, and as I passed these two fields I thought they were the handsomest I had ever seen. The stand of wheat was perfect, there was not a square foot that was not just as good as any other in the field all over on both fields. Of course I imagined that my wheat was a little bit better than my neighbor's. But I tell you I would not dare to say so. Just before harvest time we had two or three storms that knocked this wheat down badly on both fields so that it did not do quite as well as you would expect. My neighbor threshed first—he had 42 bushels to the acre. That was a good crop, one seldom equalled in our neighborhood. I always change work with this neighbor. When I threshed my wheat, along toward night as I was passing through the barn he said to me "There is 42 bushel to the acre out now," and the separator was still running. I had him mark the number of bushels himself. He said "You have beaten me on the wheat just the same as you did on the potatoes." The separator kept on running till we got out an even 50 bushels per acre on this field. We had one other field in wheat, the poorest one on the farm, one that when we went there 25 years ago was really so poor that it would not grow decent weeds. On this field we had a trifle over 45 bushels per acre. So that the average was $47\frac{3}{4}$. That is the largest crop of wheat ever grown in our section. The larest on record on ten acres or more of land.

There have been men that have grown a single acre to come up to this. I do not say these things to boast, but simply to illustrate this point: the amount of fertility that we can get by a systematic growing of clover. We have been working right on that line for a long time. Take this farm that originally was the most run down of any you could pick out, by continuously raising surface-growing crops. By taking that land and growing clover in regular rotation we have been able to bring it up until it has produced the largest crop on record anywhere in our locality, and a crop 50 per cent. larger than this land ever grew in its virgin state of fertility. Many farmers, I think fail to get the best results in this line of growing-fertility by not giving the clover very much of a chance. In many cases I find they grow timothy seed in the fall, and then in the spring they sow their clover seed on timothy and wheat sod. The timothy and wheat occupy the soil, use up all the plant food there is there, and the clover seed has very little chance. Drainage is often necessary before we can get the best results in this line. Also we found we must keep all stock off from this land, to get the very best results in tillage ; not to go on the land at all except when necessary to draw manure or draw off the crops. It took years to find all these points out. We had to find it out by experience. It did not take a great while for us to see that it was not wise to turn our stock on to our young clover after harvest, but it took longer to find that we must not turn on to our clover at all. If we wanted the very best results we must keep the ground loose, not having it tramped by animals at any time. Of course it might be done when the land was quite dry. I think we have been the gainers through our treatment of the clover—by clipping the clover and wheat stubble after harvest, running the mowing machine over it once or twice and letting it all go back to the land as a mulch. If there are any weeds there at all, they will die at once, and you will not have any trouble from mice. If you pasture the clover a little and they leave spots here and there high the mice will get in and do damage. Of course we prevent all weeds going to seed. We expect to have a crop without regard to season. I do not care whether it it rains a drop after the 1st of April next season or not. I will have a couple of good clover crops anyway. In fact we do not care much about dry weather now anyway ; we can get on without it if we can only get rain in the winter. I always cut the wheat myself and I always notice how the young clover is. If there is a spot in the field where it is not doing well we give it a top dressing of manure and put on quite a good dose of it. We use all our manure in this way on this young clover to make it grow evenly and strong all over the field. We are after that $57 worth, more or less, of plant food per acre.

Q.—When do you put on that top dressing?

A.—Right after harvest. Any time when we have time along in July or August. Practically we cannot spread that manure unless it is rotten. We do it by machinery. We use a manure spreader.

Q.—What other crops do you grow in rotation?

A.—We have followed a three-year rotation of clover, potatoes and wheat, plowing the second growth clover under the next spring for potatoes, and then putting wheat in after we take the potatoes off without plowing, and then seed the wheat to clover in the following spring again, and keep this rotation up.

Q.—You do not plow after potatoes?

A.—No ; there is no time to plow land and get it settled again.

Q.—Take off the tops?

A.—We have to take off the tops if the potatoes are at all late. We can grow early potatoes and get the tops decayed so that we can break them up without taking them off. If we grow medium early potatoes we have to rake off the tops. We do not burn them ; we spread them on the clover land we are going to plow next spring. You notice, the second crop of clover we let go back to the land.

Q.—How many pounds of clover do you sow to the acre?

A.—About a bushel to five or six acres. Leaving the young clover in the ground through the winter not only mulches the surface and increases fertility in that way, but it keeps live roots in the soil to gather up any fertility that may otherwise go to waste in the winter when we have heavy rains. It is just as bad for land to be idle as it is for man to be. The more we make our land do the better. Bare land grows poorer and shady land grows richer. Keep that clover to shade the land until you are ready to put in another crop.

Q.—How do you sow your clover seed?

A.—Use a Cahoun clover seeder. Carry it by a strap around your neck. I always sow about the last of February when the conditions are favorable. *Honey comb* surface, when freezing and thawing first begin.

Q—Do you harrow?

A.—No, sir; that is too early to harrow. You could not get on the ground for a month after that with a harrow.

Q—Is your land clay?

A.—Partly. A light sandy soil you might harrow—not on ours.

Q.—What stock do you keep on your farm?

A.—Work horses and one cow to give us milk is all we have had for many years. Years ago before science had discovered that clover had these abilities, or was able to prove these points true, many of us practical farmers knew these things must be so from our experience and I have preached this doctrine through the papers and at institutes long before science could back me up. You were calling out the point that I was not keeping any stock. When I first began this plan I was laughed at and sneered at by a great many men—intelligent men, too—but I felt certain we were right on these points. I remember this neighbor said to me 14 or 15 years ago: "How are you going to get along without manure?" and I said to him, "You just watch and you will see."

Q.—What quantity of potatoes did you get?

A.—I do not suppose our yields will seem large to you, because you are further north. 200 bushels per acre is pretty good. We have grown 300 bushels.

Q.—Do you feed your clover hay or sell it?

A.—We feed whatever we can, and if we get ahead we let it go back to the land.

Q.—Do you think clover hay is better for horses than timothy?

A.—Worth about one-third more per ton. If you want horses to go fast clover is bulky, and it is better perhaps for some to use timothy and grain. There is no question about the nutritive quality of clover if cut when in bloom.

Q.—How do you harvest the clover?

A.—We generally mow in the afternoon, beginning about two o'clock. Much depends on one's judgment of the weather. We try to mow just after a storm centre has passed. We keep a barometer. In fact I would not know how to farm without one It is generally cool then, and the next day will be a clear day but not very warm. We let the clover lie till it is right to rake up. Then we rake it into large windrows. I rake it myself, because I want to turn these heads all down—butts up in the air. Dew on the butts will not do as much harm as on the heads. Next day, about nine o'clock, we run through with the fork and lay them over on to dry ground, and in about a hour after rush into the barn. Of course if the weather is threatening we do not leave it in the windrow over night.

Q—Suppose it is a little green have you any trouble with its keeping quality.

A.—No; if it is drawn in in the middle of the day when it is warm, that is a great point. We do not use any salt.

Q.—When do you cut?

A.—I like to cut when the clover is in full bloom. Speaking about feeding clover to horses, I ought to have said clover hay is more likely to produce heaves. We sprinkle when we feed. We have a pair of work horses that we have been experimenting on for thirteen years. We took a pair of good blocky horses six years old. I paid $380 for them and refused $500 the next spring. They had been fed timothy hay and grain heavily. We gradually worked them off the timothy on to clover. We were a month doing it. At the end of the month we got them on clover without any grain. For 13 years they have had nothing but clover hay. They have done all the work of our farm, and there has not been a time they were not in as good order as any other team in the neighborhood of the same age. They are nineteen years old now. Of course we had to be careful in feeding. We water the horses first, feed them lightly in the morning, lightly at noon, and then heavily at night; if they were working hard, about all they would eat at night. You have no idea how much of a furore this created in Northern Ohio. My neighbors would not believe it.

Q.—Did you cut the hay?

A.—No, sir; we fed it whole.

Q.—What do you call feeding lightly?

A.—About what they would eat in an hour and a half. I am not advising this way of feeding. There are many times it would have been handier to have fed grain at noon They would eat about thirty or thirty-five lb. of clover a day.

Q.—How do you handle your horse manure to keep it to the best advantage.

A.—We usually keep five horses in the stable, winter and summer. We spread this manure evenly in our covered barnyard, and we pack it so that the air will not get in. We have a cement floor in the stable and the liquid manure is absorbed and that makes it soft and moist.

Q.—Is it the ordinary red clover you use?

A.—Yes. We could not grow Mammoth clover and get two crops.

Q.—Did you ever have any experience with scarlet or crimson clover.

A.—I have seen it in Delaware. It is termed the mortgage lifter there. I do not hink you could get very much out of it here. It is too far north.

Q.—Have you had any trace of clover sickness?

A.—No. The probabilities are that we are growing clover too continuously. There may be some disease come along that will prevent us growing clover. We might sow cow peas one season.

Q.—How do you get the wheat straw into manure?

A.—We have not been able to do so. We draw it out and spread it on the land. It don't gain anything by rotting.

Q.—Do you plow deep or shallow?

A.—We plow deep, but the deepening has been very gradual. We plow a little deeeper every time we break up the sod, because I am certain potatoes do best in a deep soil, especially in a dry year.

REPORT OF COMMITTEE ON ECONOMIC BOTANY AND ENTOMOLOGY.

Presented by Prof. J. H. Panton, Agricultural College, Guelph.

The committee appointed to collect information concerning the presence of injurious insects, fungi and weeds throughout the Province of Ontario, issued 200 circulars of enquiry to the secretaries and some others of the Union.

The replies received come from the following 24 counties: Renfrew, Lanark, Leeds, Prescott, Addington, Lennox, Hastings, Russell, Prince Edward, Peterboro', Waterloo, Perth, Lambton, Peel, Welland, Grey, Wellington, Huron, Brant, Middlesex, Oxford, Dufferin, Durham, Bruce. The accompanying blank form shows the nature of information sought—and if properly filled supplies very valuable notes upon weeds and insects:

GUELPH, October, 1894.

DEAR SIR,—At the last meeting of the Ontario Experimental Union, a committee was appointed to collect information regarding the presence of injurious insects, fungi (mildews, smut, blights, etc.), and weeds throughout Ontario. You will confer a favor by filling out the following and sending it to me at as early a date as possible.

F. C. HARRISON, Secretary.

1. Names of ten most common weeds in your district.	2. The ten worst mildews, blights, smuts, rusts, etc.	3. The ten worst insects.	4. Names of any new weeds or blights likely to be injurious.	5. Names of any new insects likely to be injurious.

Information in reference to colums 4 and 5 is particularly requested. If you have applied any remedies for injuries from insects or mildews, etc., *give your results.*

REMARKS.—

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The following is a summary of the replies received :

1. The worst weeds reported.

1. Canadian Thistle (Cnicus arvensis).
2. Couch grass (Agropyrum repens).
3. Mustard (Brassica Sinapistrum).
4. Ox-eye Daisy (Leucanthemum Vulgare).
5. Ragweed (Ambrosia artemisiæfolia).
6. Burdock (Arctium Lappa).
7. Wild Oat (Avena fatua).
8. Blueweed (Echium Vulgare).
9. Cockle (Lychnis Githago).
10. Milkweed (Asclepias Cornuti.)

47 species of weeds are referred to, but the above ten are those which have been mentioned by ten or more observers.

2. New weeds reported as likely to be injurious.

Perennial Sow Thistle (Sonchus arvensis).
Rib grass (Plantago lanceolata).
Russian Thistle (Salsola Kali var. Tragus). Near Tilbury and Smith's Falls.
Teasel (Dipsacus Sylvestris).
Spring Clotbur (Xanthium spiriosum).
Water Hemlock (Cicuta maculata).
Bladder Campion (Silene inflata).
Chickweed (Stellaria media).
Penny Cress (Thlaspi arvense).
Mare's Tail (Equisetum arvense).
Wild peas (Vicia Cracca).

It is hoped that observers will report the technical names of plants as far as possible, as the use of common names in many cases is very confusing, as is seen in such names as redroot, wild peas and pigweed. Bulletin XLVI, or Report O. A. C., 1889; Bulletins LXXXV and XCI, Report O. A. C., 1893; Bulletin XCVIII, Report O. A. C., 1894, will be found useful in the study of weeds.

3. Worst Fungi reported.

Rust (Puccinia graminis).
Smut (loose), (Ustilago Carbo).

Apple "Spot" (Tusicladium dendriticum).
Black Knot (Plowrightia morbosa).
Gooseberry Mildew (Sphærotheca mors-uvœ).
Pear Blight (Entomosporium maculatum).
Peach Curl (Taphrina deformans).
Strawberry Rust (Sphærella fragariæ).
Potato Rot (Phytophthora infestans).
Potato Blight (Macrosporium Solani).
Pea Mildew (Peronospora Viciæ).
Elm Leaf fungus (Dothidella ulmea).

4. New fungi likely to be troublesome.

Plum Rot (Monilia fructigena).
Anthracnose of Raspberry (Glœosporium Venetum).
Tomato Rot (Macrosporium Solani).

Those who report having tried Bordeaux mixture to prevent fungi, mention that they have had favorable results. This fungicide may be considered one of the best in use. A successful mixture known as Bordeaux mixture is 5 lb. of Copper Sulphate, 4 lb. good, fresh lime and 40 gallons of water. O A. C. Reports, 1886, 1888, 1890, 1894, contain information upon some common forms of fungi (see part II).

5. The worst insects reported.

Potato Bug (Doryphora decem-lineata).
Grasshopper (Melanoplus fernur-rubrum).
Cabbage Worm (Pieris rapæ).
Horn-fly (Hæmotobia Serrata).
Codling Moth (Carpocapsa pomonella).
Currant Worm (Nematus Ventricosus).
Tent Caterpillar (Clisiocampa Americana).
Pea Weevil (Bruchus pisi).
Curculio (Conotrachelus nenuphor).
Turnip-fly (Phyllotreta viltata).

Besides the above, 25 additional species were reported, but only by a few observers.

6. New insects reported likely to be injurious.

Aphis on turnips, oats and peach leaves.
Bud Moth (Tmctocera ocellana).
Bark Louse (Mytilaspis pomorum).
Borers (apple), (Saperda Candida), (Chrysobothris femorata).
Maple Worm (Dryocampa rubicunda).
Army Worm(Leucania unipuncta), near Petrolea.
Granary Weevil (Calandra Granariæ).
Cabbage Maggot (Anthomyia Brassicæ).
Poplar Borer (Seperda calcarata).
Lice (cattle), (Hæmotopinus —).

Bulletin LXXXVII and O. A. C. Report, 1893, furnishes information upon insecticides and how to use them.

The committee thank the observers for the information which they have given, and hope they will continue to take an interest in this work. The Professor of Natural History at the College will always take pleasure in determining the species of plants or insects referred to him. We would recommend observers in their returns to mention any remedies which they have found successful against insect and plant pests referred to.

Committee { F. C. Harrison. G. A. Robertson, J. Hoyes Panton,

ADDRESS BY MR. WM. MULOCK, M.P.

Mr. President and Gentlemen,—When I listened to Professor Panton telling us of the number of enemies that the vegetable kingdom had to encounter, he enumerated ten weeds and ten parasites, and I thought of when I used as a student to pick up a medical book belonging to a medical student and imagine I had every disease that the book described. As I listened to Professor Panton it seemed to me that the whole of our efforts on behalf of agriculture were likely to be counteracted by these desperate parasites. However, the College exists to show that there is a way of dealing with the enemies of agriculture. We know that in the whole of society there is one parasite living upon the other; in the human race, amongst the lower animals, and throughout the world it is the same—

" Big fleas have little fleas
Upon their backs to bite 'em;
And little fleas have lesser fleas,
And so, *ad infinitum.*"

And it is to provide the remedies to protect against these thistles and mustard and burdocks and the army worm, that has gone into winter quarters to come out next spring—it is to protect us against these things that science is encouraged through this and kindred institutions.

I am greatly pleased to be here to day, both for the sake of seeing the work done and to meet our friend Mr. Terry, whose name has been a household word to all who take an interest in the great cause of agriculture. (Applause). For years I have been reading his works, and what he has written in the agricultural journals, and I can venture to say with the utmost truthfulness that to no sources have I gone with greater profit than to these books, magazines and papers which he advantages by his contributions; and when he gave his account of the way he restored fertility to his soil, it was almost as if he was giving an account of a similar experiment I made at my own farm and with similar results. In fact I cannot accuse him of having borrowed a lecture I delivered to him at lunch, but it did sound to me almost like an account I was telling him. In other words, when he summed it up by saying, he kept only one cow, it simply illustrated what we all ought to know, that the manure is right over the soil and that every farmer can grow his own manure. I am conducting experiments on that line and every year I grow a large quantity of manure. I have not always confined myself to clover; when I want to grow it more rapidly, I grow peas. It was thought at first a mere experiment, but now I think in my district it is recognized as an economical way of adding to the soil.

I want to express my own direct indebtedness to Mr. Zavitz for some useful advice he gave me a year ago. I was extremely anxious to get hold of a better corn for our section for ensilage purposes, and he gave me the result of his experiments here, gave me his various reasons why this, that and the other kind would thrive in this, that and the other place. Acting upon his advice I purchased a kind of corn from Wisconsin called Salzer's North Dakota, and we planted fifteen acres of it and we planted it in rows three and one-half feet apart, and we never hoed that corn once. The corn being a shallow feeder there is danger of destroying a great many roots by hoeing, and last summer the hoe was never put into the corn once. Instead of that we used a weeder, and I can say with all truthfulness, I am not an agent for the weeder, but I happened to see this weeder recommended and I got the weeder from Boston. A boy and one horse would go over the land in the forenoon. The field was kept cultivated that way all through the summer, and the corn matured much earlier than any corn I have had in previous years. We began to cut it about the middle of September. I estimate my silo to hold 200 tons—about 8,000 cubic feet. This corn was not dry when it was put in and it packed solid. The silo was filled up to the ridge, and we let it settle. I had two men in tramping as it was going in, and also afterwards for three or four days. When it had settled down a little, we filled it again up to the ridge, and it settled down to the plates, so we have 8,000 cubic feet from that point to the ground. Mr. Pearce says that means 200 tons, and it does not represent more than half the yield of that fifteen acres. The land was good, strong soil, had been in wheat, was well manured, plowed in the fall, manured in the spring, cultivated well and treated with this weeder—never one single moment's hoeing, during the whole summer—and no hand labor upon it, except one boy for five days and a fraction over went up and down the rows to pick out the odd mustard seed that had escaped the weeder. I am indebted to Mr. Zavitz for having recommended a corn that yielded nearly thirty tons to the acre. That is an illustration of the fact of keeping the soil up. Keeping it fine on top acted as a mulch all through the summer, and resulted in the soil continuously acquiring fertility from the nitrogen in the air.

I would say in conclusion that the work done by the agricultural institutions, such as this, and the farmers' institutes, and so on, are making the Ontario farmer the most advanced farmer under the sun. (Applause). We recognize now that the Ontario farmer is treating his former finished article as raw material, and produces a more advanced article in the shape of butter and cheese and live stock. In that way our farming industry is destined to progress.

However, I thank you, Professor Mills, for looking at your watch. (Laughter). I am reminded that time does fly. When I get talking agriculture my heart being in the subject I forget all else, and I would be reminded of it when I get home if I missed the train. Therefore, with best wishes for the success of this institution, and that these re-unions may continue, and that the twenty-five hundred or three thousand young men that we have throughout this land now, graduates of this institution, may be devoted to the advancement of our country, and that we may have many, many more Terrys to assist us—with all these wishes, and thanking you for having listened to me so faithfully, I say good-night.

FRUIT EXPERIMENTAL WORK.

By L. Woolverton, Secretary Ontario Fruit Growers' Association, Grimsby.

For a long time I have been watching with great interest the progress of the work conducted by the Experimental Union, and noticing the valuable results which are being brought about by the systematic plan of work that has been pursued.

All expermental work is necessarily slow and unremunerative to the individual, and the results are more frequently for the benefit of others than for himself, but to the man who loves it, the many avenues, as yet untrodden, opened before him are delightfully attractive. How much Canadian fruit growers owe to such men as the late P. C. Dempsey, of Trenton, who delighted in experiments in hybridizing apples, pears and other fruits, and whose Dempsey pear is to-day one of the claimants for the first place among pears of its country; to Professor Wm. Saunders, of the Central Experimental Farm, Ottawa, for the many new fruits and flowers which are the results of his careful experimental work; and to the late Charles Arnold, of Paris, whose Ontario apple, in addition to his other hybrids, is rendering his memory famous. Let us hope that the experimenters have not yet all passed away, but that the many young men who are now coming to the front will not only emulate these illustrious names, but will aspire to write their names one niche higher on the rock of fame.

For many years I have been more or less engaged in this work, though not especially in the lines of raising new varieties, but rather in that of testing varieties already introduced. I have spent much time and money in this line, but the longer I engage in it, the more anxious do I feel to pursue it still farther.

I come here not only as the representative of your sister organization, the Ontario Fruit Growers' Association, but also as one of the representatives of that new departure of experimental work which has been lately undertaken by the Minister of Agriculture, and of which I have the honor to be secretary. The object of this organization is to work along specific lines, and to use every effort to make fruit growing what it ought to be, as it should be one of the most paying industries of our province.

The plan of operation is unique. We select as experimenters only such men as have already had long experience in the lines which they are to pursue. For instance, we have chosen one of the most experienced grape growers in the Niagara district as experimenter in grapes—a man who is already largely engaged in this work commercially as well as experimentally. To the eighty varieties of grapes which he has in hand, we we will add all known varieties, and furnish him with forms, a sample of which I here place before you, which are to be used by him year by year and duplicate copies sent in, one to myself, as secretary, and one to Mr. Hutt, representative of the college at Guelph. Two kinds of forms are furnished each experimenter, one for a descriptive list of varieties, and the other for a record of the experiments of each season. In all, ten stations are contemplated, which we hope will cover all the principal varieties of fruits and the different climatic conditions of the Province of Ontario. The annual report of the work done at each of these stations will be published year by year, and will become more and more valuable.

We need your co-operation in carrying out our object. You can aid us by testing in your own localities such varieties of fruit as have been approved of by our experimenters, and you will thus be able to report upon the adaptability of these fruits to your own conditions, soil and climate. The advice so often given in the past is surely played out. It was "Plant what your neighbors plant." This would lead to no improvement, and we would be as conservative as the Chinese, and three thousand years from now would be "in *statu quo*."

Suppose now that I try to point out to you some lines of work in which experiments are needed. For example, let us first consider the grape, and ask ourselves what does the public most wish to know with regard to this work? First, What soil is best? Will clay or sand produce the finest fruit? I have a Concord vineyard on sandy loam that produces from three to four tons of the finest bunches per acre, but a neighbor of mine, Mr. F. G. H. Pattison, claims that in his vineyard, which is on clay, the fruit ripens and can be marketed before I commence picking. Is it possible that grapes will ripen so much earlier upon clay soil than upon rich, deep, sandy loan? Then, some claim that the Concord is sweeter when grown upon clay than upon sand. Is this true, or is it simply the result of the somewhat earlier ripening, and the contrast thus noticed at the time of early picking?

Then, second, How much manure should be given the vineyard, and what kind? Should strong growers like the Concord and Wilder receive as much as weak growers like the Delaware? My Wilder vines are on good rich, sandy, loam. The ground has been well enriched and the vines grow rapidly, but give little fruit. A neighbor of mine, Mr. T. P. Carpenter, of Winona, says that his Wilders are among his most productive varieties, and he attributes this to the fact that he applies to them a very small quantity of fertilizer and also ceases cultivation early in the season. My Concords under this same treatment bear immense loads. This would seem to indicate that the Wilder should receive very little fertilizer of any kind in order to bring about the best results. Then as to the kind of fertilizer that should be applied to the vineyard. Many say that barn manure makes too strong a growth of wood and gives too little fruit, and that potash as found in wood ashes, and phosphates as found in bone meal and apatite is most suitable. Who can give us a definite reply?

As for cultivation, I do not believe this can be too good. This is the one thing in our country concerning which we are too careless, and we need to take a lesson from the old country gardeners. We expect grapes to grow in sod without cultivation and hope to reap paying crops. The sooner this notion is exploded the better for all concerned.

And what about trellising? This is an important yet extensive part of grape growing, and why does it need to be as expensive as many make it. I have found that No. 13 galvanized wire is heavy enough, and in my experience about three strands are sufficient for the Fuller system of training and two for the Kniffen. Then posts do not need to be so numerous as we often see them. Good cedar posts six feet high above the ground and twenty-five apart will answer every purpose, if upright slats are set up between, and the wires firmly stapled fast to these as well as to the posts.

The best method of bracing is often a great bug-bear to inexperienced grape growers. I have found the simplest plan is to brace with wire, one end fastened to the top end of the post and the other to a stone firmly buried in the ground, and the wire thus held at on angle of about forty-five degrees. This method of bracing is both next and permanent.

The pruning of the grape is in a very unsettled state so far as the system is concerned. What plan is the best for Ontario? This should be decided by the comparative test of each plan in the same vineyard. At present we find many systems. For instance, the fan system, which is much practiced in the Niagara district, the Fuller system, the Kniffen system, and the "sluggard's" system. The last is very common, for by it the vine takes care of itself and climbs up over fences and trees until the grapes themselves are almost out of reach. I once saw an instance where the best grapes hung on the top of an old apple tree twenty feet high where they could only be gathered by the birds. Certainly no experiment is needed to test the value of this method. In my opinion, the fan system is not the best. The old wood rises yearly higher up and soon the whole trellis is covered with a mass of old vines. Besides it is, as handled by most people, no system at all. I do not think it necessary to experiment much further with this method. The question of desirability lies between the Fuller and the Kniffen systems. According to the Fuller system two arms are trained along the lower wires and the young wood yearly trained back within one or two buds of these arms. The young wood is then tied up to the other wires as it grows during the summer. The Kniffen system, on the other hand, has four arms, two about three feet and the other two about six feet from the ground, and from these the young wood hangs down as it grows during the summer. It is not necessary for me to describe these methods in particular, as no doubt you are all familiar with them. There is no doubt that the latter method requires the least labor, but in my experience the Fuller system has this advantage that the vineyard has a neater appearance, if properly cared for, and the old wood kept so near the ground that it is quite easy to give it winter protection if necessary.

The time of pruning is also another subject of inquiry. Many defer this operation until the month of April when the vines bleed profusely. The question is: Does this bleeding reduce the vitality of the vines and consequently fruitfulness, or does it not? On this there is a variety of opinion, and experiments in this line are, in my opinion, very much needed. Then should we attempt to do any summer pruning? It has been laid down in books that it is wise to pinch the end of every bearing branch within a couple of leaves beyond the last bunch of grapes. No doubt this is desirable, but should more than this be attempted? Some think it wise to remove in summer certain amount of young wood which is not bearing fruit, but in doing so a certain amount of foliage is removed and the foliage is necessary for the proper ripening of the fruit.

Then the question of ringing for early ripening is still before us. It has been advocated by some experimenters that there is an excuse for ringing, that some varieties which would otherwise not ripen at all can be ripened and marketed at a good profit by this method, and the quality is little, if any, impaired. I was surprised during the last grape season when walking through my experiment vineyard to find one branch of a Goethe, Roger's No. 1, fully ripe, while the whole of the rest of the vine was laden with green grapes. This variety as you know seldom ripens in our climate, but the fruit on the branch to which I have referred was not only highly colored, but had attained its natural flavor. Should we then entirely condemn the practice of ringing, or should we defend it under certain circumstances?

Then the old question of varieties will never be settled, and will offer constant opportunity for experiment for all time to come. The public is always inquiring what are the best varieties for profit and what are the best varieties for dessert purposes. In my experimental grounds at Grimsby I have over seventy-five varieties, and out of them all I would choose very few for planting for profit.

Of black grapes the Concord still takes the lead. It is an excellent all-purpose grape of strong, vigorous Lubrusca blood, and withstands more than most varieties, all insects and fungi. It originated with E. W. Bull, of Concord, Mass., who, they say, is now living a poor man notwithstanding he gave to the world so excellent a gift. This grape was first exhibited at Boston in 1853. My Concords were harvested this year between the 12th of September and the 12th of October. During this time they were constantly improving in flavor, and after the first of October they were, to my taste, much superior to the Worden. The yield was seven tons, and although these sold at the low price of $30 per ton, yet I cannot complain when I compare the profits derived from other lines of agricultural produce.

Of the other black grapes I may mention Wilder. With me so far, it is one of the finest black grapes in quality, but a poor bearer, but it succeeds so well with others that I shall yet hope to have better results in the near future.

Moore's Early I am much pleased with as an early grape to precede the Concord. This year it colored well and sold well in the markets.

Black Giant is a large productive grape, but, in my opinion very poor in quality.

Of white grapes, I do not yet know of any variety more profitable than the Niagara. It is like the Concord in productiveness and nearly as healthy, but somewhat subject to peronospora which causes the berries to shell off, especially on poor land, and to become insipid. When well ripened, I consider the Niagara an excellent general purpose grape, and, on account of its great yield, one of the most profitable. Yet when you speak of it as a dessert grape, it lacks quality. Indeed it will surely be pronounced insipid by one who first tastes a Salem or a Lindley.

The Victoria, one of the numerous seedlings raised by Mr. T. B. Miner, of Linden, N.Y., was this year a favorite white grape with me, and I am inclined to think that it will yet take the foremost place among white grapes. The bunches are well shaped, the skin has a fine waxen lustre, heavy bloom and the berries are of a good size and fair quality. The vine is very productive. By some this grape is called a white Concord.

El Dorado greatly took my attentien this season. It is one of Rickett's seedlings, a cross between the Concord and Allen's hybrid. The berry has a beautiful waxen-white appearance and when fully ripe attains a golden yellow color with a thin white bloom. It shows beautifully when contrasted with red and black grapes on a fruit dish. The quality is, in my opinion most excellent.

The Triumph (Campbell's Concord Hybrid, No. 6) also took my fancy, but unfortunately it is too late for our climate and does not ripen as well as the Catawba. Otherwise it is an excellent bearer and the bunches are very large and fine. It is a cross between the Concord and Chasselas Musque.

Noah is another grape that is a little late for Ontario, but ripened very well with me this season. The bunches are fine, but the berry is small. It is a heavy bearer. This grape was first disseminated in 1876.

The Pocklington ripened well this season at Grimsby and is, in my opinion, superior to the Niagara in quality, but is not nearly so productive.

Of red grapes the Lindley is my favorite red grape for profit. The vine is very healthy and productive, the fruit is good quality and beautifully colored. It packs well in baskets with the Concord and Niagara, and these three so far as are my favorites for the vineyard, because they sort up well together when I wish to make an assorted package of red, white and black grapes for dessert purposes. The Lindley was produced by Mr. Rogers by hybridizing the Wild Mammoth grape of New England with the Golden Chasselas.

The Delaware will probably rank as the choicest table grape, but I consider it scarcely productive enough to be planted largely for profit. This year it produced a crop of fine bunches, but, as a rule, averages less than the Lindley and the vine is much less vigorous.

Woodruff Red was this year a most showy grape in my vineyard. The berries were large and of a bright carmine color, with a heavy bloom. It ripens earlier than the Concord. The quality, however, of this grape is not good enough to deserve much commendation. Still for a fancy package of assorted grapes, I would like to try for a change Woodruff Red for red. Victoria for white, and Wilder for black. This grape originated with Mr. C. H. Woodruff of Ann Arbor, Mich., in 1874.

The Brighton grape did fairly well with me this season, but suffered from downy mildew more than usual. Perhaps it was because it grew in close proximity to the Salem, which is quite subject to that form of mildew. The skin of this grape is almost too tender to make it very desirable as a first-class shipping variety, and when fully ripe it is too dark in color to rank high as a red grape, but of all the grapes of which I know, none please me better for my own table.

I have thus given you a few extracts from my own notes of varieties which succeeded with me during the past season, hoping that it may lead some of you to make further tests in this direction during the coming season.

There is another wide field of experiment before us in reply to the constant inquiry as to how we shall best overcome the insects and fungi to which our fruits are subject. The experiments which have been conducted during the past season go to prove that the mildew of the grape may be almost entirely overcome by the faithful application of sulphate of copper previous to the appearance of the foliage, and the Bordeaux mixture later on during the season. This latter should be applied first when the leaves are from one to one and a half inches in diameter, and the second application when the flowers are open, and the third about fourteen days later. The application of powdered sulphur, especially for the destruction of the powdery mildew, is very effective, but for both forms the Bordeaux will be found equally effective, and probably more simple of application.

Now, I have opened up a large enough list of questions of interest to grape growers which will afford a field for experiments for a long time to come, and when we consider that some inquiries meet us in connection with the growing of the various other kinds of fruits, you will see that the field for experiment and investigation before us is very wide, and will agree that we are not attempting too much when we are devoting to each principal kind of fruit a separate station in order to secure the most careful results.

Mr. Lick : I think there is one idea we must remember, that is, the importance of experimenting in these fruit lines, and of following these experiments for a term of years until we arrive at the conclusions which will be safe for us to follow and put in practice. I may ask if you have much difficulty in getting out varieties of fruit, true to name from the nursery ?

Mr. Woolverton : In some instances I have had difficulty, but it would not be fair on an occasion like this to say where I have succeeded in getting plants true to name and where I have not. I have now over 70 varieties of grapes and I have been identifying them with descriptions in books, and I think out of that list of grapes there are not over two which are not true to name. I know on one occasion I got 20 varieties of plums and when they came to bear I tried them, and I think perhaps five out of the 20 varieties were true to name, all the rest were quite wrong.

A Member : I think the best way is to deal with honorable nurserymen.

Mr. A. M. Smith : It does not seem fair for me to get up and blow my own horn- but with regard to getting fruit that is not true to name I think the fault rests with your, selves You very seldom see an agent come along with a blank order but what you will see in it a clause "If we haven't got the varieties called for we may substitute others which we think equally desirable." And in a great many instances these agents may have the trees that are called for, and they may have certain varieties that they are anxious to get rid of, or that they can buy a great deal cheaper than the ones called for, and they think best to substitute the varieties they have, for the ones called for. I do not know that all nursery agents are dishonest; there are a great many that are no doubt honest men. I was much pleased with Mr. Woolverton's paper. There was a great deal in it that I would like to have discussed. I would like to ask him in what way he thinks our work here could be connected with the experiment stations ? Could the two not be worked together so that one will be an extension of the other ?

Mr. Woolverton : I think it is quite possible to do that in this way, as the stations find that certain varieties are of particular value and adapted, as far as they know, to Ontario. You, individually, might have these plants sent to you by the Union—single plants or cuttings for testing—so that you may see how they are adapted to your own particular soil and location. That the stations cannot do, and you can do ; and that is the only way these varities can be properly tested.

OBSERVATION AND EXPERIENCE DURING A SEASON WITH THE TRAVELLING DAIRY.

By F. J. Sleightholm, Humber, Ont.

I will just say a few words as to the travelling dairy. That question is pretty well understood; everybody knows about the travelling dairy, and there is no need of an introduction. As regards the effects of the travelling dairy we have heard considerable, especially through counties where the travelling dairy has been before. I have heard very encouraging remarks of the travelling dairy and its work through the province. Very frequently, after meetings, farmers and their ladies come and say this and that and the other of the travelling dairy. Sometimes it runs in this line: "We find the travelling dairy has been a benefactor in this section; the butter is better. We find the storekeepers speak very highly of it.'

Now and again at our meetings there will be a gentleman come up and want to know the price of the butter worker, and then he will want to take the measurement, and so we find that in this and similar ways interest is spreading in regard to making butter on the farm. In some sections not so much interest was evinced, as in other parts, this season owing to the extreme amount of rain; people who live on clay land had such an extraordinary amount of work to do in a short time, that they could hardly be persuaded to leave home.

During the summer our meetings were fairly well attended. During the whole season we found much satisfaction in the work of the travelling dairy. In the last two counties we visited—Elgin and Norfolk—we had exceedingly fine meetings; people having turned out in great numbers. We meet with different sorts of experience. I was at one meeting, and had been talking some little time on the work, and the question of working butter came up. I had spoken of the worker and drawn attention to it, and a gentleman stepped up from the audience and he said, "I would like to ask you a question." "The women of this section don't work the butter as you do. They sent me up here to ask you whether you think it advisable to work butter, as you are doing it with this worker, or whether you think it would be better to work it up with your hands." I just simply said I thought the worker was the better way. All these things have to do with the travelling dairy. I must say we have met very many intelligent men and women who are well acquainted with the ins and outs of making butter on the farm. Sometimes I have felt that despite what we might offer, if we could only get the people to do as much talking as we were doing we would have been much more in the position of pupils than they. We have found satisfaction in our work and it certainly has been an enjoyable journey.

I find that people take interest in the churn. They want to know why butter does not work this way or that way, and I judge from what I see and the interest that people take in these things, not only the young men but the old men, that they are very strongly impressed with our way of handling butter in every shape and form. At one meeting a gentleman brought us a sample of skim milk and butter-milk all the product of one cow, and he said, "I want to know what are in these" So we ran them through the Babcock tester for him, and when I got through I gave him the result. The test said something like this: whole milk 4.2, skimmed milk 1.5, and the buttermilk .6; of course it was not very good churning. I made a few remarks on these points and he allowed me to get through. Then he got up and said, "Mr., I would like to say a word. I want you to understand that we drink all our skim milk and buttermilk, and if we don't get it one way we get it another." I sat down. He had a perfect right to drink his buttermilk; but I said if he was a farmer with 20 cows on his hands he would need to have a family with considerable capacity to drink all the buttermilk and skim milk he would have.

At one meeting a gentleman brought us a sample of skim milk from shallow pans setting 6 inches deep, and there was 2 per cent. of butter-fat in it He had not a very satisfactory milk room, and he was making a mistake. People brought us samples of skim-milk set in deep pans in water drawn from the well or set in the well, and we found that, with very rare exceptions, there was not good skimming When we had skimmed milk brought to us set in ice-water we found first-class skimming. Then again some would bring us a sample of 24 hours' or 36 hours' setting in shallow pans, and they would want to know if it was advisable to set 24 or 36 hours.

Usually we find there is no more butter-fat in 24 than 36 hours' setting. There is the possibility of over-confidence in Ontario as regards ability to make cheese. A man will come to me and start to talk about butter, and say : "Of course we know how to make cheese ; we are on the top in cheese ; what we want to know is how to make butter as well as we can make cheese." There may be a great error creep in here, because when a man gets so far on that he knows all about anything, he will never learn any more. And there is another possibility in the same direction as regards the effect of feeding. I remember in one case, I was speaking regarding the effect of feeding roots upon the quality of butter and cheese, and one gentleman said, "I can feed turnips and turnip tops to my cows, and an expert does not know whether I feed them turnips or not, unless I tell him." Another gentleman said he had fed turnips to his cows always, since he had been a boy. A lady got up in the meeting and said, "Sir, in this section there is a man kept a large herd of cows and fed them turnips and made butter, but the butter was so strong he could not eat it, and so he sold the milk to the cheese factory." It was all right to send milk that was not fit to make butter to the cheese factory. A gentleman brought me a sample of cream, and I told him I could smell turnips on the cream with my nose two feet away from the can. And I told them if they were feeding turnips to their cows in that section they would have to consider whether their butter and cheese could be sold. I told them I met a cheese buyer some time ago, and he bought cheese largely in that section, and I asked him regarding their cheese and he said, "As a rule we make from a half to three-quarters of a cent difference on cheese where the cows had been fed on turnips. I suppose you are aware that two factories in this county have cheese on hand that they cannot sell, it tasted so largely of turnips." I find very many people here experts on butter and we get some very fine samples of cream, and we find some very poor cream, and there was considerable cream which would be called ordinarily fair cream. I must say we are a little too well satisfied with middling good butter, and I find a great many people are just at that stage that they don't get any further.

ANNUAL SUPPER.

After the close of the afternoon session, President Mills invited all the guests, ex-students and other visitors present, to join the College officers and students in the College dining hall to partake of the matron's hospitality.

After supper was served various toasts were proposed and ably responded to by members of the Union and by visitors. Mr. T. B. Terry, in response to the toast to the visitors, gave his popular address on

The Wife's Share.

Mr. President, Ladies and Gentlemen,—We have been holding farmers' institutes in our state and our country for a number of years the same as you have here, and we have tried at the evening sessions to discuss some subject that would be of interest to mixed audiences where ladies came from the town as well as from the country. We tried to get up something that would be interesting as far as we could and still instructive.

Now, it is one of the speeches that your speaker has given a good deal at night sessions of institutes, that was selected for this evening. I am sorry that there are not more ladies here to-night, I would like to have them here to back me up. Of course I am going to talk in favor of the ladies entirely, and as I have an audience mostly of men, perhaps I will do the most good. If you will kindly listen closely to the first few sentences, they are the foundation on which I will try to build.

Two men go into partnership to do business together. Each one of them has a little capital, perhaps, which is thrown into a common fund. They both work faithfully for the good of the partnership. Now, the profits that arise from the business are equally divided as a rule; at any rate each partner has a certain fixed share of the income that is his individually.

Now, will you please tell me why, when a young man and a young woman enter into a partnership to do business for life the same rule should not hold good? Why should one partner hold all the salary and the other one, when she wants anything, have to go to him and ask him for something in a begging way. Woman is not yet looked on as quite the equal of man, that is all the trouble. That old curse pronounced against Eve when she sinned, "Thy desire shall be to thy husband and he shall rule over thee," has not yet been quite forgotten. By the way, that is one command of his Maker that man has never failed to obey. (Laughter).

An old clergyman who heard this lecture one evening, said he liked my lecture on potato culture a great deal better than he did my theology. But, my friends, my potato lecture may be wrong in some respects, I believe my theology is right, because it is based upon everlasting truth and justice, and this cannot change. I am going to try and convince you it is right before I get through.

How do some of our best Bible students now understand that passage? I quote rather as a prophecy than a law which should be always binding. It is considered an announcement of a fact that should occur through a long period of time but not necessarily one that should hold forever. As Eve in yielding to the tempter acted alone, now as a penalty she should in the person of her descendants be made to suffer from the cruel and tyrannical treatment of the other sex. Well, we have only to consult the history of the race to see how completely this prophecy has been fulfilled in all ages—more particularly in the east, of course—down to the present time. The spirit of christianity and of simple justice of these latter days is fast doing away with this part of woman's severe sentence. No doubt very many can be found in this christian land who can say with Paul, "Wives submit yourselves unto your husbands as unto the Lord, for the husband is head of the wife, even as Christ is head of the church." Possibly some of you old men have quoted that to your wives before now.

Well, my friends, it is not fair to quote Paul on one side and not on the other. You know Paul also says, "Husbands love your wives even as Christ also loved the church and gave Himself for it." Oh! What love could be stronger than that? What husband could love his wife like that, and not make her a full partner with all the partner's privileges, rather than a slave to be tyrannized over. You see Paul's counsel was all right when we take it as a whole in one sentence by itself. We must remember the time when Paul wrote these words and the condition of woman at that time, and then we can hardly fail to see the more than human wisdom contained in them. The men of that day would read that first passage about the husband being the head, and of course they would say that was all right; they would come to the second passage about loving your wife and they would not object to it, and if they lived up to all Paul said the wife would get all Paul asked for and still get it in such a way as not to antagonize the public sentiment of that day. I believe if Paul were on earth again and re-writing these words, with civilization advanced as much as it has the last nineteen hundred years, he would leave all that out about the husband being the head. It seems to me that the time has come when the last vestige of this old curse should be wiped away; when woman should be acknowledged the full equal of man in every respect, and when in partnership with her husband as having earned a certain share of the income by her individual effort. Otherwise she is a slave, and there is no partnership about it. Perhaps you will think these pretty strong words, but see if I will not prove them before I get through.

Suppose one of you should hire a woman to help your wife in the house, you pay her a stated sum per week in cash, thus acknowledging woman's labor as having a cash value; but perhaps this very same man does not think of paying his wife anything. No, that is another matter altogether. If she wants any money to do what she pleases with, she must select a time when her husband is in good humor, after a good dinner such as we have had here to to-night, to ask him for some change. It is not impossible that she may be met with a harsh refusal. Why, he may even say, "Where is all that I gave you last time."

Imagine one partner speaking to another like that; how long would two men stand that sort of work? But it makes a difference when one partner is a man and the other a woman. Perhaps when the wife asks for change the husband says, "What do you want to do with it?" just as though it were his business. Just as though she had not earned a portion of that money.

I remember some 10 or 12 years ago of having something to say on this point at a farmers' institute in Wisconsin, and as I was going out of the hall that night a lady came up to me and said, "I never wanted to speak in a meeting so badly in my life, as I did to-night." Well, of course, I asked her what she had on her mind, and this is what she told me. She said, "I was calling on a farmer's wife only last week; he is a well-to-do man; his wife and he have worked hard, and they have got in real good circumstances. While I was there a sewing-machine agent came along who was selling a little attachment for the machine, which the wife decided she wanted (the price of it was only 60 cents), and finally she turned around to her husband who was sitting in the room reading, and very pleasantly said, 'John, would you please let me have 60 cents?' And his reply was, 'No, I have no money to invest in such tomfoolery as that thing is." Now, my friends, I say that woman was a slave, a white slave, there is no other word in our English language to express her condition. Only one will in that house could have its way, and that was the will of its lord and master. Do I put it too strongly? Not one dollar could that woman have as her own after 30 years hard labor, not 60 cents to do as she pleased with; her will must be under the control of another. If that is not slavery don't blame me. Webster does not define it correctly. I would not have you think however, because I have drawn this illustration from the farm that all men of this kind are found on our farms; human nature is about the same all over. We will draw an illustration from the town to match this. Perhaps to-morrow morning I will have something to say about a little fruit garden we have, where we get all the berries we can eat for 11 weeks. Every day we can pick a half bushel of some kind out there. We do not intend to grow berries to sell, but just have all we want ourselves, but of course there will be times when there are more than we can use. On an occasion of this kind I once took a half bushel of black berries to a friend of mine who lives in the town, and the next morning when his wife was canning these berries her mother came in and saw her putting them up, and she thought it would be nice for her to have some to can, and so she wrote me on a post card and asked me to bring her a half bushel, and I took a half bushel to this lady's house. Her husband is one of the solid business men of our town, one of our best citizens. He is a wealthy man; I do not believe he spends one-fifth of his income, —an old man soon to drop into the grave where he cannot take any of his money with him. He is also one of the pillars in our church. He came to the door when I rang the bell, and I told him my errand, and he said, "Come in, and we will see Mrs. ———." I knew what was coming right straight. I told him I had brought the berries his wife had ordered. I followed him in. His wife arose when we came into the room, and he says to her, "Mr. Terry says he has brought you up a half bushel of berries you ordered; how is it?" "Why," she says, "I was over to Jane's the other morning she was canning some berries she got from him, and I thought it would be nice for us to have some to can to, and I ordered them." "Well," he says, "you know I don't care anything about canned black berries myself; if you want them of course you can have them." There was not anything particularly unkind in the way in which he spoke, but it was between the lines what would happen if that poor woman dared to take these berries after she had ordered them. In fact I was standing there all this time with the berries in my arms in a half bushel basket. He did not ask me to put them down; just because the order did not come through him—because his wife had gone ahead and done a little matter like that. Well, she looked as if she would sink through the floor when her husband spoke in this way, and I felt about that way. And at last she said, "Mr. Terry, if it won't make any difference to you I guess I won't take the berries;" And, friends, I got out of that house some way. I choked down my wrath and got out; I never knew how from that day to this; I was thoroughly angered. I felt as though I would give every dollar I ever had in my life for a chance to choke the man. Of course that is not a right spirit to show; it was not the man I wanted to choke, it was the action. I am not saying that the man or any others are bad men, not at all. He is not a bad man; he is one of the best men in our community. How is it that men can go on in this way and still not be conscious of it. I will tell you a little incident that occurred in Cameron, Missouri, while I was illustrating the point. A lawyer got up in the audience when I got through talking and said, that up to the time he was 20 years old he lived at home on the farm and his mother had always done the milking although she was then 65 years old. It was the custom in that neighborhood for the women to do the milking. A young lady came there to teach school, from a part of the country where this was not the custom, and she thought to do a little missionary work I suppose, and she said to this young man one day: "George, if I were a great, strong, hardy boy like you I would not let my poor old mother milk." "Why," he said, "it went through me like a flash of lightning." He had never thought anything about it, he added, to the large audience composed of his neighbors and friends, and he said, from that day till he left the farm his mother never milked another cow, showing the noble spirit of the man. Now, these two illustrations that I have given you, one from the farm and one from the town, are, of course, extreme ones I have purposely selected such in order to make this matter very plain. There are few men that would act anything like as badly as these two men I have picked out. I think there are a good many who are not quite willing to acknowledge the wife's rights, the simple right to dip her hand right down in the money bag and take out some just as she pleases, because she has helped to earn it just as much as her husband has.

In the year of our Lord, 1894, there is only one right way to look at this matter. I want to give you my matrimonial platform. It is about time we had an improved one. I am very glad there are so many young men in the audience to-night. If you only had your girls here with you I would be all right. Possibly something I may say may do these young people some good; that is what I want to do. I always like to talk to young people. I do not suppose the older ones here will change much. In fact, my old gray-haired friends, I do not believe it would be safe to let your wives into the pocket book since they have been kept shut out so long. (Laughter.) If we can start the young ones on the right track that will be all right. At the close of the afternoon session in one of the institute meetings, a young farmer and his wife invited me to go home with them to supper. They said they had a particular reason and they wanted me to go home with them and I must go, and of course I went. After supper we were sitting around the fire, and the husband said to me, "You did me a special favor once and didn't know anything about it yourself. It was to tell you about this we invited you here. Some four or five years ago you were making the speech of the "Wife's Share" at the Farmers' Institute, and I was there with my best girl. Up to that time I had been very bashful, I had long been wanting to go into partnership with this young lady, but never had quite courage enough to say anything to her about it. I had been over to her home half a dozen times with my mind made up that I would have that matter settled for life, but when it came to the point I could not say a word to save my life. While listening to you, a way out of my trouble came to me, so in going home I said to her, 'How did you like that matrimonial platform?' 'Well," said she, 'I thought that was just exactly right.' 'Well,' I says, 'will you start out on life with me on that platform.' 'Well,' says she, 'I will.' (Laughter and applause.)

Now, if any of you young men would try this plan on your girls in the future just let me know how you come out. Suppose our young farmer just starting out with his wife, says to her, "I will plow, sow, reap and attend to the out-door business generally, while you do the work that is only connected with the home; we are full partners, and I will consult with you about any important matters and shall expect you to do the same with me; whatever we make shall be just as much yours as mine." There is no uncertain sound about that plank, that means something. "Neither of us shall ask the other for small sums of money that we may want to do with as we please, but simply help ourselves out of the general fund. In large deals we will of course consult together about it as partners should. We will have confidence in each other's judgment not to ask any questions about small amounts. The fund shall be just as accessible to you as to myself. If you take out a dollar simply put down in the cash book, ' Wife one dollar," I would have him a business farmer and know what he is about, so when his wife takes out any money she must make an entry. "I would pay you," he continues, " a stated amount each month to do with as you please ; but that would then place you in the light of a hired servant. We pay our servants, and we give money to beggars." You cannot pay your wife or give her money without making her a servant or a beggar. " Whereas," he continues, "you are my trusted equal partner, and I consider your labor just as important and just as laborious in its way as my own is."

Now, I want to ask you in all seriousness, if you don't think a man and the wife would live happily together on such a platform as this? Even if Paul did say, nearly two thousand years ago, " Wives submit yourselves unto your husbands as unto the Lord, for the husband is head of the wife, even as Christ is head of the Church." And if Dr. Albert Barnes, in commenting on that passage, says " So in every family there should be a head ; some one who is to be looked up to as the counsellor and ruler ; some one who should be superintendent. God has given that prerogative to man, and there is no family prosperous where this arrangement is violated." I do not want prosperity on any such terms ; I would rather go without.

I am very glad to be able to state to you, and I have it directly from an intimate friend of the family, that Dr. Barnes was not such a sort of man in his family arrangements. His wife and he were as fully partners as any couple on earth could be. Why did he preach so far behind what he practiced? Men do not generally do that. They generally preach better than they practice. We can only conclude that he thought that the time had not come for preaching as advanced ideas as he practiced. You can lead men better if you do not get too far ahead of them ; so I think if Dr. Barnes were on earth again, with public sentiment as far advanced as it is, he would leave out about the husband being the head.

Man can no longer claim, when urged to admit their wives as equal partners with them, that they are not of equal ability. When admitted to our colleges they show that they are sometimes better. At Cleveland a few years ago, the trustees met together and decided to admit young ladies to the college, to obtain an education on equal terms with the young men. For some 60 years the institute had existed and only young men were allowed to go in. They tried admitting young ladies for three or four years, and then they met again, and in a quiet way they said no more young ladies can come into this institution. What was the trouble? Just this, and nothing more : they were afraid that the young men would not come there—the institution would not be popular with young men, because the young men would have to study as they had never studied before—the young ladies were taking too large a proportion of the honors ; hence this step backwards, that every true man in our state is ashamed of. Mark my words, that college will never prosper. What have they done now? Built an annex, and call it the " Woman's Annex," where young ladies can come and obtain an education ; but they cannot compete with the young men, because, forsooth, they are too smart. Nor can we claim that woman's work is not of much importance. It is good to work hard, if you do not work too continuously. It is the everlasting monotonous character of the farmers' wives' work that makes it so hard. It is not washing dishes, baking, and sweeping floors ; but this she has to do week in and week out for all time, seven days in the week and 365 days in the year. In our work there is more change and variety ; our work takes us to the blacksmith's shop and to the mill, while the good wife's work goes on, sweeping the same carpet with the same old broom—washing the same dishes in the same dish-pan. It is that everlasting sameness that makes it so hard, and then the fact of working seven days in the week at regular hard work. You men don't work but six days in the week, and if you go to church does not your wife have a little of the hardest day on the Sabbath, particularly when there are children in the family? I think she does, unless you men are different to the majority. Some men cannot get ready for church themselves without calling on their wives to help them.

Many a time I have seen my wife finish dressing after she got in the carriage to start for church. Why? Because she was working as fast as she could to get us all ready. How is it when you come home from church? Why, we well-to-do farmers keep on our best clothes, and get in our easy chair and take our paper, religious paper of course, and read and have a good time. Does the wife do the same thing? No; our farmers' wives do not as a rule. She must change her clothes and go out in the kitchen and get the next meal for the men, and when it is all ready we move up and eat it. Then we men clear off that table and wash those dishes, don't we? No, we do not; the good-wife does it just the same as she has done every day in the week. Now, it is these facts taken together, that are filling the insane asylums of this bright land with such a large proportion of farmers' wives. There is no question about that. I remember going home with a farmer at the close of a morning session of an institute some years ago to dinner. He asked me to go with him; it was only about a mile out. He has one of the finest herds of Holstein cattle in our state. We went through the barn before going to dinner, and of course he was proud in showing me around; his cows were bedded in straw up to the knees, two men to take care of them, and he had the best arrangement that could be made for them. We went in to dine, and we had a good dinner, but it was presided over by such a tired, worn out, despondent-looking wife, that it completely ruined the dinner. I could not help contrasting the position of that man's wife with his cows in the barn. We would not have worked a horse out the way that woman was. I thought over the matter while at dinner, and at the close of the meal I asked his wife, "Cannot you come with us to the institute this afternoon?" Her eyes brightened up a little and she turned around to her husband, and he spoke right up for her, and he says, "Ma don't care about going out to such places as that," and that settled the matter. Cannot we learn a practical lesson from this. Take our wives with us as much as we can when we go away from home. Let us take them to the institutes with us, and to farmers' clubs and granges, as I think these are doing a noble work all over the world;—a place where a man can go and take his wife and daughters with him. In some parts of our country where I go to institutes, it is the custom to give the wife her share out of the chicken money, in other places it is the butter money. Well, now, is the wife to do just as she pleases with it? Pin money as we call it. I remember at one institute, after I got through talking a lady stood up in the audience, and her husband was right beside her, and she put her hand on his shoulder and said, "What do you think of my husband? He gives me the chicken money, and then he expects me to buy all the groceries for the family with it.

At a little town in Pennsylvania last winter a lady said that she had the butter money, and she was very economical; she never went upstairs but what she got out her bag of money and looked the money over, and said, "That is mine; I have earned all that." But that she never got ten dollars ahead in the world but what her husband would borrow it from her and never pay it back. (Laughter and applause.)

Now, honor bright, friends, as we boys used to say at school, is not this giving the wife the butter money, under these circumstances, putting her off with the tail end of the business? It don't look like taking her in as a full equal partner. Don't misunderstand me. I don't object to the wife keeping chickens, but what I do object to is, pointing to that little pile as the wife's and the big pile as the husband's money. Put it all together and call it ours. I don't want my wife earning money in some little side show apart from me; no, we will pull right together as long as the good Lord lets us live.

There is one view of this question that interests me deeply; it may be new to some of you. It is getting to be a common custom among the ladies who move in the higher society to get money out of their husbands in a questionable sort of way, for example: A lady gets a dress made; we will suppose it comes to $20—I do not know as I have got that high enough; she says to the dressmaker, "you make out a bill for $30 and send it to my husband, and give me the difference, $10; he will pay it to you; but if I ask him for money he will say, 'what do you want with money when I pay all the bills?'"

After speaking on this subject in one large city, a lady came to me and said she had $300 in one savings bank in that place and her husband did not know anything about it. She told me how they began life poor and worked up. Her husband was then well-to-do, but when she would ask him for a little money he would sometimes say things to hurt her feelings, and she just made up her mind she would not ask him again, so when she went down to his store and he was busy waiting on the store, and she saw enough in the drawer so that he would not miss $5 or $10 she took it out and banked it in her own name. "Now," she says, "I suppose you call that stealing but I do not;" Well, I did not know what to say—it is a pretty serious question.

At one institute in northern Indiana, the wife of a leading professional man came to me at the close of the institute, introduced herself boldly and told me her husband's occupation, and told me what I do not think he would have put in print with his name attached for $10,000—he is one of the solidest men in the state. She said, "I have a new way of getting money that you have not spoken of to-night. I go to Chicago to do our trading; my husband is known there; I have a commutation ticket and he gives me enough money to pay my street car fare, and that is about all. Now, the neighbors often send in by me to get articles—sometimes ten or fifteen dollars worth, and if it is anything I can have charged to my husband I do so, putting the money in my pocket, and for years I have systematically got my spending money in that way unknown to my husband."

In a little town in Pennsylvania last winter, some of the business men came around after the meeting and said, "You need not go out of this little town for examples. One grocer said that the wife of a well-to-do farmer who was in the audience that night came to his place a few days before, and she had a list of goods she wanted put up; in it was a dollar's worth of sugar. She took me to one side and whispered to me and said she wanted me to leave that sugar out, to charge it to her husband, not putting it up, and give her the dollar. It was just before Christmas and she wanted some money to buy presents for the children, and did not know any other way to get it.

Now, all these things can be corrected by taking the wife in as a trusted partner. The serious point of this is, what are the children and grandchildren to be from such parents? Would it be any wonder if we have stealing and deceiving children growing up in such families. Do you suppose the little people do not know what is going on. Unless they are duller than I was when I was a boy they will know. If mother can do it of course the children can when they get a little older.

You have probably noticed that our laws are beginning to acknowledge the husband and wife as equal. Now, let me say that if you are not willing to go on this platform of equal rights, don't go home and say mean things. If you are not ready to come up on this platform, let me beg of you to give your wives the wages of a servant girl; don't oblige her to ask you for a little change when she wants it. I remember once going out from an institute and a good old lady came up to me—one of those good motherly-looking ladies, her hair almost as white as snow; I presume she was nearly 70 years old, and the tears were standing in her eyes as she talked to me. She said, "I do not remember that my husband ever positively refused me a dollar in the world when I asked him for it, but as old as I am, if there is any way under Heaven that I could earn the money unknown to him I would do it before I would ask him for it." I have been in that family visiting three or four times, and I assure you she is one of the most refined ladies I ever met. There are thousands of women all through this land feeling like that down at the bottom of their hearts, and it is for these women I plead to you to-night; try this same plan. If you won't go the whole platform, give your wife five or ten dollars a month and never ask her to account for one cent of it; let her feel like a free woman, and let her say that she has got a husband and not a lord and master, and you need not fear but what she will make this money go as far as you would. Ten to one she will spend more of it for your comfort than she will for her own, (applause,) and it will do her a world of good to buy presents for you and the children with money she has earned. You ask how I know this. I know how grinding it would be for me to have to ask my wife for every dollar I got—I simply would not do it. Now, friends, I fear I would go a little further, perhaps, than I ought, but I would dissolve the partnership, and so would nine men out of ten. Well, talking on this subject at an institute, a lady told me after the meeting, another lady sitting in the audience behind her whispered to her "If our husbands would only all treat us as that man speaks of we women would not want to go to heaven." Is there another thing that would come nearer bringing heaven down to earth. Of course, what has been said has been in a kindly spirit; you notice I am not blaming any of these men. We get into the habit of doing certain things, and I think some good can be done by talking over these matters. If as a result of what has been said here to-night one woman shall be given her just rights, or one young man should be led to start out on the real platform, I should feel the time of this meeting had been most grandly spent. (Applause.)

SECOND DAY—MORNING SESSION.

ELECTION OF OFFICERS FOR 1895.

The following is a list of officers and committee elected:

Honorary President..........................Dr. James Mills, O.A.C. Guelph.
President..........................C. A. Kiel, Chatham.
Vice President..........................D. Z. Gibson, Willow Grove.
Secretary..........................R. F. Holtermann, Brantford.
Treasurer..........................H. L. Hutt, O A C., Guelph.
Editor..........................C. A. Zavitz, O.A.C., Guelph.

Auditors: Messrs. Patterson and Clark.

Committees on Experiments.

Agriculture. C. A. Zavitz, B. S. A. (Director); Dr. Mills, Prof. Shuttleworth, P. O. Vannatter 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, E. G. Emigh.
Dairying. Prof. H. H. Dean, (Director); H. L. Beckett, B.S.A., S. P. Brown.
Economic Botany and Entomology. Prof. J. H. Panton, (Director); L. W. Lang, F. C. Harrison, B.S.A.
Live Stock. G. E. Day, B.S.A., (Director); N. Monteith, B.S.A., W. W. Ballantyne, R. E. Cowan.
Representative to the Central Farmers' Institute, R. F. Holtermann.

On motion, the matter of selecting County Secretaries to fill the vacancies in the list, was left in the hands of the Executive Committee.

POINTS ESSENTIAL TO SUCCESS IN HOG RAISING.

By J. C. Snell, Edmonton, Ont.

The men who have succeeded in originating, establishing, and perpetuating distinct breeds of swine and other classes of live stock have been men of genius, men of skill and good judgment, who have conceived an ideal in their mind, an object and aim which they kept constantly in view and to which they patiently worked. These men have been among the world's greatest benefactors, have been instrumental in adding millions to the wealth of the nations, and their names and work are worthy to be held in lasting remembrance by those who follow them.

The originating of a breed is, generally speaking, the work of a life time, requiring patience, perseverance and a determination of purpose which will not be swerved from the straight line—which leads to the desired goal. It would perhaps not be wise for many men to attempt such a work, and the best thing for the average farmer to do in this line is to take up the work where successful men have left off, and study to maintain the excellencies already attained, and to improve upon them if they can by judicious selection, mating and management.

The choice of a breed is, to the new beginner, an important matter, but not the most important. The question which is the best breed of swine has not been settled and probably never will be by anything near unanimous consent of the breeders. In England, the home of most of the breeds, there is as much difference of opinion upon the subjects as there is here. And in the United States, where several very useful breeds have been originated, the battle of the breeds is being as fiercely fought as ever it was. There are many good breeds of swine, and the keeping up the standard of excellence is more important than the choice of a breed. The choice should only be made after a careful consideration of one's circumstances and surroundings, of the objects in view, and of the market he has to supply. When a choice has been made, and it is found by experience to be reasonably well adapted to these surroundings, the man who takes pride in the breed he has adopted and stands by it, through evil as well as good report, will, in the long run, prove a successful breeder. " Be not carried about with every wind of doctrine " is safe advice to follow in the business of breeding, as well as in theology. Fashions may change and "booms" for a breed may come and go, every breed will have its ups and downs, its seasons of prosperity and of adversity, but the man who stands by his favorites, keeps them up to the highest standard of the breed, and seeks to improve them by judicious selection, so as to conform as nearly as possible to the type which the market for the time being calls for, will, in the long run, find himself as often "in the swim" as any other.

Having made choice of a breed, we should next fix in our mind an ideal or standard of type to which we aim to attain, and in all our work the effort should be to maintain a uniform type, to breed so that each animal in the herd shall be as nearly as possible like all the rest in general appearance, in stamp or style, and that, of course, a good stamp. This will necessarily involve a rigid system of weeding out of the weakest and worst, and a careful selection of the best, for the purpose of maintaining the standard of excellence of the herd

Good judgment will especially be required in the selection of the sires to succeed each other, and here a false economy may do much to impede improvement—may indeed work much mischief and upset the work of years. Do not grudge a good price in order to secure the stamp of sire you feel sure you need, if you can find him. The best is generally the cheapest if the price is a reasonable one. "The sire is half the herd" is a strong statement but is probably not too strong when we consider that he has a part in all the increase of the herd, while the dams have only a part in the production of their own offspring. It is mainly if not entirely, by the use of the sire that changes in style or improvements in the quality of the herd is attained. If we find that individuals among the females of the herd are deficient in some point, we aim to correct this in the offspring by using a sire that is exceptionally good in that point, and if the general character of the herd is not in harmony with the changed or changing demands of the general market, the best and wisest course, in my judgment, is to seek to work a gradual change in the type by the selection and use of a sire which comes as near to the desired type as can be secured, and then, by selection of the females in the produce which are nearest to that type, the characteristics of the whole herd, may, in a comparatively short time, be changed without going outside the breed we have for fresh blood.

Success in hog raising, in my opinion depends very largely upon the application of common sense to the methods of management, and the points to be observed are but few. In the first place, I think that for the best results the dam should be at least twelve months old before producing her first litter. If she is 15 or 18 months old I believe it will be better for her, as she will grow larger and stronger. It is a mistake to depend too much upon young sows and to kill off the older ones before their usefulness is gone. As a rule the older sows produce larger and stronger litters, and make better nurses. The sow should have abundant exercise and access to the earth during the season of pregnancy. When the latter is not practical, as in the winter months, such substitutes as ashes, charcoal and roots should be supplied, but exercise must be secured even if it has to be compelled, and to this end they should be fed at some distance from their sleeping apartments, and in cold weather upon dry feed, with access to water at will.

I think the best seasons to have the pigs farrowed are early spring and early autumn. Pigs born in March and April can be got out upon the ground in five days for exercise, and the variety of condiments which instinct teaches them to look for and which seem to be essential to their health and growth can be obtained. Pigs born in these months are old enough and large enough in the following November and December for breeding—

the boars for service and the sows to produce litters when a year old. If intended for the butcher, they may, by good feeding, be fitted for the market from September to November, having attained the weights required by the market in these times. As a rule it is best to select the sows to be kept for breeders from *spring litters*, for the reason that the summer months are most favorable for out-door exercise, which tends to develop bone and muscle, and to lay the foundations of a strong constitution, which is an indispensable essential to the best results in breeding.

Pigs born in September and October may have, and should be given, abundant exercise during the first two or three months of their lives in order to secure strength of bone and development of muscle to fit them to endure the confinement necessarily incident to fattening pigs in our winters, but if they are to be kept for breeding purposes, every effort should be made to give them exercise in fine weather—even in winter. Pigs born late in the fall and in the winter are liable to go off their legs for want of exercise, or to get stunted, and from having to be confined in close quarters have not the best chance to grow into strong and vigorous stock. Those farrowed in the early autumn will be of good size in April and May to breed for early fall litters again, and those designed for the butcher will be fit to go off in the early summer months, when pork generally brings the highest price. While I do not, as a rule, favor breeding a sow to produce more than one litter in the year, yet I will say that it is quite practicable; and when the sow has attained maturity and is strong and vigorous, she may, if well cared for, produce two litters in the year, and keep it up for several years to advantage. There are few animals on the farm that are more profitable than a good brood sow, and when one has a sow that is doing good work he should prize her, and keep her breeding as long as she is satisfactory.

Success in hog-raising depends very much upon the start the young pigs get, and in order to a good start a good deal depends upon the treatment and condition of the mother before the pigs are born. If she has had sufficient exercise and a proper variety of food to keep her in perfect health, and is placed in a pen by herself a few days before farrowing, with a fender of plank around the pen, about eight inches from the floor to protect the pigs when the mother lies down, and with a scanty bedding of litter of short straw, the sow may best be left in quietness to produce her litter. In the majority of cases, and when the conditions are favorable, she should not be meddled with, and will attend to her own business better than any one can do it for her, but in exceptional cases, when the weather is cold and the pen not warm enough for the comfort and safety of the little ones, or the sow is restless or vicious, it is well to be on hand, to take the pigs away as they arrive to a warmer place, to rub them dry and return them at intervals to the mother till she gets over her trouble, when they may safely be left with her. The pigs may be induced to eat when quite young—say at three weeks—by placing some warm milk in a low, flat trough in an adjoining pen, or a part of the pen partitioned off so that the sow cannot take it. They should not, for best results, be weaned before they are eight weeks old, although the common practice is to wean at six weeks. After they have been weaned a week or ten days and have learned to eat well, they should be allowed to run out upon the ground in fine weather, and for the rest of their lives, if kept for breeding purposes, should never be confined for many days without access to the earth. If intended for the butcher at an early age, or at any age, they will be the better for a fair amount of exercise and a run upon the ground.

In closing this paper let me say that I think the farmers of this province do not sufficiently realize that in these times of low prices for grain they may readily make themselves independent of the grain buyer by turning their attention more to dairying and hog-raising. These two industries work well together, the skim milk being one of the very best foods for pigs, and there is scarcely room for doubt that a much better price can be obtained for grain by turning it into butter or cheese and pork than by placing it on the market. This is a change which can be brought about without any large outlay of money, and which any farmer in average circumstances may gradually adopt to his manifest advantage. The establishment in our own country of large slaughtering and packing houses, where live hogs are bought at good prices all the year round, is now a realized fact, and the farmer may, by coupling these two lines of work, secure a good market for his grain, enrich his farm, and have a little money coming in every week in the year.

Mr. Wm. Rennie, (Superintendent of College Farm): For the last few years that I was on my own farm, I bought all my pigs at from $1.50 to $2 each. I had made up my mind that it was cheaper than keeping a sow all the year round. Since I have been at the College it has been with a view to breeding altogether. A system we have adopted at the College with very great success, is feeding all breeding animals on coarse feed instead of concentrated feed, such as grain. Our pigs since last spring have not tasted grain. We have commenced feeding our breeding pigs on coarse food—simply bran and middlings, mixed with boiled roots, the year round; we commenced this system last spring and we have had very good success by this method of feeding. This was illustrated very strongly yesterday in Mr. Terry's address on clover. The same holds good with cattle. I was pleased with Mr. Terry's address, in which he stated he has fed his working horses on clover for eighteen years, and the sooner the farmers of Ontario understand that it is better for the stock, the better it will be for them. The bill for grain at the College the past year is a mere nominal one—the cattle are not getting any grain We have some steers, and they are merely getting a taste of grain with this coarse food, and they will be finished off with grain.

Some persons told our President that our pigs were not looking good—they were pot bellied. That was just what we were aiming at; we wanted good stomachs. At the time of the sale the reason our pigs were looking so well was because we carried out this idea. A few weeks before the sale we gave them a little grain and that took away the pot belly and made our pigs look healthy, and slick and nice. Of course there are a number of details: we rub them in the summer with seal oil. That keeps all vermin and flies away. We do the same with all our cattle. No flies touch the cattle, if you keep seal oil on. The same with regard to the sheep. I have no doubt the heads of the College will admit the sheep never looked better, and they have not tasted grain since last winter. Two or three of them have lambs at the present time and the lambs came nicely.

Mr. Monteith: Mr. Rennie made mention of the fact that he put seal oil on cattle; has it proved successful in the prevention of the horn-fly?

Mr. Rennie: Yes; we do it once a week; every Monday morning we rub the cattle with oil, and when you go out in the fields you will find the cattle lying comfortably around and no flies bothering them. We put a little carbolic acid in the oil—about a tablespoon full to the quart and that seems to kill this horn-fly; it is just the crude carbolic acid.

Hon. Mr. Dryden: Mr. Rennie said there were certain little details; I want to point out that these little details are where people fail. If he had not told you about the carbolic acid you would have failed in putting on the seal oil. I practiced this same thing and found it efficient. He did not tell me seal oil; he said fish oil. I went to the best oil men I knew and asked for fish oil, and they did not have anything in the oil trade by that name and did not know what I meant; they sent me down some samples of awful stuff that was not fit to put on cattle, or pigs, or anything else. I afterwards found out what it was that was wanted and I got the right thing. Don't let us forget that in all these discussions we must pay attention to the *little details*; if a man gets half a truth and finds some error, he thinks the whole thing is a fraud Tanner's oil will do just the same thing. I think carbolic acid is an important part, and the crude carbolic is very cheap.

Mr. Rennie: Seal oil is fifty cents a gallon in Toronto. The cost of putting this oil and carbolic acid on cattle is about one cent a week for each animal; it makes the animals handle better, and they do better. And when the flies are troublesome to the horses it is better than the fly net. We just buy a cheap sponge and use it for the purpose of putting on the oil.

Hon. Mr. Dryden: You must cover the whole of the animal; if you leave any part not covered the flies will gather on that part.

Mr. Rennie: There is no trouble in finding where you have missed any space on the cattle in rubbing, because you will find a whole bunch of flies on that part.

A Member: I clip my cattle and put the oil on, and I find it does one take so much oil. I clip them in the fall.

REPORT OF EXPERIMENTS IN AGRICULTURE.

Presented by C. A. Zavitz, B.S.A., Agricultural College, Guelph.

As Director of the co-operative experiments in Agriculture, I wish to submit the report of the work carried on by the committee during the year 1894. There were in all fourteen experiments—two with fertilizers, three with fodder crops, three with root crops, five with grain crops, and one with potatoes. As there are a good many before me, who are somewhat unfamiliar with the exact work which is being carried on by the Committee on Agricultural Experiments, I will endeavor to give in a few words the outline of this co-operative work. There is a regular system underlying the whole of the work as carried on by the Experimental Union. During the past few years we have carried on extensive experiments at the Agricultural College with all kinds of farm crops. Within the past six years, we have tested about 150 varieties of oats, 110 varieties of corn, 180 varieties of potatoes, etc. After growing varieties for five years in succession, we drop out the poorer ones and keep on with the leading varieties. For instance up to the spring of 1894 we had grown 80 varieties of oats side by side for five years in succession, we then dropped out about 60 of the poorer varieties and kept on with seventeen of the kinds which had given the best results. New varieties are added to our lists each year, and you see on these sheets before you about fifty kernels of each of all the varieties which were grown during 1894. There are about 350 varieties in all. The varieties which are thus represented are the best among those which have been tested at the college during the past six years. From these varieties we have again selected the best, and sent out over Ontario some five or six varieties of each class for experimental purposes. In so doing we try to get all the characteristics of each class of grain or roots, or corn, etc., combined in the varieties which are sent out. For instance, in the case of oats the aim is to send a variety possessing a long straw, and one possessing a short straw; one with a spreading head and one with a side head; one early to mature and one later to mature; one with a white grain and one with a black grain, etc. So that from the six varieties sent out there is almost sure to be one or more varieties which will prove highly satisfactory upon the soil in which they are sown, whether it be of a heavy or a light character.

During 1894 we sent out 7,721 packages of seeds and fertilizers to 1,340 experimenters. Nearly all of those who received this experimental material wrote to us after harvest, giving the results of their experiments. Owing to the exceedingly wet weather during the Month of May and the drouth which followed, a number speak of failure. Grasshoppers, poultry, etc., caused other failures. Great care has been exercised in selecting only the full reports of carefully conducted tests for the summary report here presented. Five hundred and four experimenters sent in satisfactory reports, which are certainly of very great value. These successful reports were from all parts of Ontario.

The greatest advantage of this co-operative work is, perhaps, derived by the experimenters themselves who test these different varieties or different fertilizers upon their own farms; but the summary results also possess much useful information in themselves. These corroborate the experimental work carried on at the Agricultural College; and these, when combined with the experiments at the college, make the results much more reliable. When the results of this work are published and distributed over the province, it brings the Experimental Union very prominently before the farming community, and shows them that, instead of the Agricultural College drawing young men away from the farm, it prepares them for making the very most out of their opportunities, as seen through the noble work carried on by the ex-students, through their association known as the Experimental Union. When the farmers realize that not only are the different varieties of farm crops, etc., tested at the Agricultural College, but also that the leading varieties are grown in an experimental way in different localities over the province, it gives them very much more confidence in the reports which are issued.

The following circular was sent out in February to the members of the Union, to previous experimenters, and to those who applied to the college for seeds:

AGRICULTURAL COLLEGE, GUELPH, February, 1894.

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 three 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, in 1892 there were 5,500 plots, and in 1893 upwards of 7,000 plots were used for these co-operative tests over Ontario. Reports of successful and valuable experiments were received during the past year from every county in Ontario.

The members of the committee on agricultural experiments are pleased to state that for 1894 they are again prepared to distribute into every township of Ontario material for experiments with fertilizers, fodder crops, roots and grains. Upwards of 800 varieties of farm crops have been tested at the Experimental Farm, Guelph, during the past five years. These consist of nearly all the Canadian sorts, and about four hundred new varieties imported during the past seven years from different parts of Europe, Asia, Africa, Australia 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 reports of similar experiments from other parts of Ontario. The results of carefully conducted experiments are presented in a summary form to the annual meeting of the Association, held in December at the Agricultural College, Guelph, 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 1894, fill out the accompanying form of application and return the same to the director of the co-operative experiments in agriculture at as early a date as possible. The material will be furnished in the order in which the applications are received until the 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 plots, will, of course, become the property of those who conduct the experiments. In return, the committee desires to ask that each experimenter will sow all the plots belonging to the particular experiment which he has chosen for 1894, and that he will be very careful and accurate in his work, and forward to the director by October 25th, 1894, a complete report of the results obtained from the tests.

Yours truly,

C. A. ZAVITZ,

Director of Co-operative Experiments in Agriculture.

At the same time the above circular was sent out, the following list of experiments for 1894 was forwarded, along with blank forms, upon which each person could make his application for the desired experiment:

No. of experiments.	Name of experiments.	No. of plots required 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 alone and nitrate of soda with superphosphate over no fertilizer with rape	3	2 rods x 1 rod
III.	Ascertaining the relative value of four varieties of millet	4	2 rods x 1 rod
IV.	Growing lucerne as a crop for fodder	1	4 rods x 4 rods
V.	Testing six leading varieties of fodder corn	6	1 rod x 1 rod
VI.	Testing five leading varieties of turnips	5	1 rod x 1 rod
VII.	Testing five leading varieties of mangels	5	1 rod x 1 rod
VIII.	Testing five leading varieties of carrots	5	1 rod x 1 rod
IX.	Testing five leading varieties of spring wheat	5	1 rod x 1 rod
X.	Testing five leading varieties of barley	5	1 rod x 1 rod
XI.	Testing six leading varieties of oats	6	1 rod x 1 rod
XII.	Testing four leading varieties of peas	4	1 rod x 1 rod

Material for No. 1 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 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 Experiment Station.

FORM OF APPLICATION.

To be filled and returned to C. A. Zavitz, Agricultural College, Guelph, Ontario.

Experiment chosen (*Indicate by number*) { First choice
Second choice

Name.. ....Line of railway..............................

Post office.... .... Township ....

Express office. ....County...

There was a greater demand for the co-operative experiments in agriculture in 1894 than in any previous year. We were, however, enabled to supply nearly all the applicants except those who applied very late. Instructions for conducting the different tests were sent at the same time that the seeds were forwarded to the different applicants.

The following letter was at the head of each instruction sheet :

AGRICULTURAL COLLEGE, GUELPH, March 1894.

DEAR SIR,—Your reply to our letter regarding the co-operative experiments for Ontario during 1894 has been received. 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 herewith 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. It is of the utmost importance that each experiment be conducted in its entirety, and that all weighings be correctly made and carefully recorded. 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 larger fields.

We hope the material which we are now forwarding will reach you safely, and that you will have good success with your experimental work.

Yours truly,

C. A. ZAVITZ, Director.

The following table shows the number of experiments used each year since 1886. It also shows the number of complete reports of successful experiments for each of these years. In the last column the number of plots used for these experiments is mentioned :

Co-operative work in agriculture. Successful experiments for 9 years :

Years.	Experiments.	Experimenters.	No. of plots.
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	1,585
1893	13	416	2,105
1894	14	504	2,520

The uniformity of results of 1892, 1893 and 1894 are very marked. The fertilizers used have given almost the same comparative results for the three past years. There is also a very marked uniformity in the average results of the co-operative experiments and of the experiments carried on at the Agricultural College. The following gives the instructions, individual results, summary results and the conclusions of each of the experiments in agriculture carried on during 1894 :

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 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.

(6) During the harvesting of the plots, watch carefully the requirements of the blank form on this page.

(7) It is of the utmost importance that all the fertilizers and grain be sown, and that all weighings be accurately made and carefully recorded.

Individual results of 18 experiments :

Experimenter.	County.	Nature of soil.	Cropping of 1893.	When and how last manured.	Weight of oats per plot.				
					Mixture.	Nitrate of soda.	Muriate of potash.	Superphosphate (mineral).	No fertilizer.
					lb.	lb.	lb.	lb.	lb.
Thos. Armstrong	Muskoka	Light loam	Oats	1893, b.y.m.	34	32	24	21	20
Dan. Campbell	Dundas	Clay loam	Wheat	1891, b.y.m.	45	33½	33	34	28
W. P. Widdifield.	Ontario	Sandy loam	Turnips	1886, b.y.m.	50	43	36	40	37
J. Baxter	Perth	Clay loam	Clover sod	....	28	32½	29	30½	18½
J. B. Warren	Ontario	"	Spring wheat.	1889, b.y.m.	66	61	53	68½	46
J. M. Horne	Frontenac	Clay	Oats	1885, b.y.m.	36	41	40	38	33
Jno. Bedford	Elgin	Clay loam	Buckwheat	1893, b.y.m.	57	59	56	57	55
W. D. Foss	Oxford	Medium sandy loam	Corn	1890, b.y.m.	17½	18½	9	13	8½
J. L. Fair	Durham	Clay	Barley	1891, b.y.m.	45½	37	39½	37½	41
Jno. H. Fair	Hastings	Deep clay loam	Indian corn	Never	35	41	31	24¼	40
J. D. Drummond.	Middlesex	Heavy clay loam	Fall wheat	1888, b.y.m.	35	30	32	30	36
Geo. Aspden	Simcoe	Clay loam	"	b.y.m	55	50	45	48	38
P. W. Pearson	York	Light, sandy loam.	Alsike clover.	Never	79	80	77	73	71
B. J. Palmer	Oxford	Heavy clay loam	Corn	1891	22	27	23	27½	27
Geo. Luxton	Grey	Clay loam	Fall wheat	1889, b.y.m.	33	42	35	38	32
F. A. Rose	Haldimand.	Heavy clay	Barley	1891, b.y.m.	34¼	29	28¾	36¼	24
Thos. B. Murray	Simcoe	Clay loam	Oats	1892, b.y.m.	24	38	23	22	17
Ernest A. Morgan	Middlesex	Clay	Wheat	5 years ago.	50	40	45	38	32

It will be observed that the soil upon which the fertilizers were applied varied in character from a sandy loam to a heavy clay. Some of the land had been manured in 1892, while for other experiments the soil had never received any manure. These individual experiments are worthy of careful study.

The following table shows the amount of each kind of fertilizer applied, and the cost of that fertilizer per acre.

Fertilizer.	Fertilizer applied per acre.	Cost of fertilizer per acre.
	lb.	$ c.
Mixture	213	4.35
Nitrate of soda	160	4.40
Muriate of potash	160	4.48
Superphosphate	320	4.16

The mixed fertilizer was composed 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 at the time of sowing the grain.

Average of 18 experiments :

Fertilizers.	Yield of grain per acre.			Average 3 years, 45 tests.	
	1892. 7 tests.	1893. 20 tests.	1894. 18 tests.	Straw.	Grain.
	bush.	bush.	bush.	tons.	bush.
Mixture	53.0	41.3	48.8	1.34	47.7
Nitrate of soda	47.9	38.6	48.0	1.33	44.8
Muriate of potash	43.9	37.6	43.1	1.21	41.5
Superphosphate (mineral)	42.4	36.2	44.2	1.21	40.9
No fertilizer	40.3	31.4	39.5	1.13	37.1

Conclusions.

1. The average results obtained by 18 experiments over Ontario in 1894, show that the fertilizers increased the oat crop as follows: Mixture—grain 9.3 bushels, straw .21 tons; nitrate of soda—grain, 8.5 bushels, straw .2 tons; superphosphate—grain, 4.7 bushels, straw .08 tons, and muriate of potash—grain 3.6 bushels, straw .08 tons.

2. The mixed or "complete" fertilizer gave an average increase yield of 23.5 per cent.; nitrate of soda, 21.5 per cent.; superphosphate, 11.9 per cent., and the muriate of potash 9.1 per cent. of oats over no fertilizer.

3. The grain crop was more than doubled upon some soils by the use of fertilizers, while upon others it was influenced to a very limited extent.

4. In 7 out of 18 experiments the mixed fertilizer gave the highest yield of grain per acre.

5. The fertilized plots gave a greater yield of grain per acre than the unfertilized in 17 out of 18 experiments.

6. In 1894 the fertilizers occupied the same relative position in regard to yield of grain per acre when applied upon either heavy or light soils.

7. With but one slight exception the fertilizers occupy the same relative position in yield of grain per acre for the years 1892, 1893 and 1894.

II. Two Fertilizers and No Fertilizer with Rape.

(1) From a section of ordinary land, to which no manure has been applied for at least four years, measure but 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 three 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 one of the packages of sodium nitrate upon plot No. I., and the other package of sodium nitrate upon plot No. II., 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.

(8) It is of the utmost importance that the whole of the experiment be conducted and that the weighings be correctly made and carefully recorded.

Individual results of two experiments :

Experimenter.	County.	Nature of soil.	Cropping of 1893.	How and when last manured.	Yield of green crop per plot.		
					Nitrate of soda.	Nitrate of soda and super-ph'sphate.	No fertilizer.
					lb.	lb.	lb.
Ont. Agr. College	Wellington	Clay loam	Barley	1890, b.y.m.	532	523	510
Henry Munro	Parry Sound	"	Oats	1893, b.y.m.	230	238	228

Nitrate of soda was applied at the rate of 80 lb. per acre upon number one plot and nitrate of soda and superphosphate were applied upon number two plot, each at the rate of 80 lb. per acre. Number three plot was left unfertilized. The superphosphate was sown at the time of seeding and the nitrate of soda when the plants were about two inches in height. The cost price of the fertilizer on the nitrate of soda plot was $2.20 per acre, and the cost of the nitrate of soda and superphosphate combined on the other fertilized plot was at the rate of $3.24 per acre. The Dwarf Essex variety of rape was used.

Average results of 2 experiments :

Fertilizers.	Yield of green crop per acre.	
	1894 two tests.	Average for 3 years, four tests.
	tons.	tons.
Nitrate of soda	15.24	14.5
Nitrate of soda and superphosphate	15.22	.....
No fertilizer	14.76	12.3

Conclusions.

1. The demand for rape seed for experimental purposes in 1894 was about as small as in 1893 and in 1892.

2. The superphosphate had no influence in increasing the rape crop, and the nitrate of soda had but a very small influence in this respect during the past year.

3. Rape can be grown to produce an average of about 13 tons per acre over Ontario.

III. TESTING FOUR VARIETIES OF MILLET.

(1) Measure off four 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 four 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.
(6) It is of the utmost importance that all the varieties be used in the test, and that all weighings be correctly made and carefully recorded.

Individual results of five experiments :

Experimenter.	County.	Nature of soil.	Cropping of 1893.	When and how last manured.	Yield of green millet per plot.			
					Salzer's Dakota.	Golden Wonder.	Common.	Hungarian Grass.
					lb.	lb.	lb.	lb.
Alfred Baker	Kent	new land	....	....	220	185	118	80
F. B. Doud	Brant	clay	oats	1893	241	240	136	96
Wm. Cumberland	Simcoe	clay loam	fall wheat	1894, b.y.m.	95	80	130	110
Jno. Henderson	Hastings	"	nothing	pasture	65	85	38	42
Ontario Agricultural College	Wellington	"	fall wheat	1890, f.y.m.	137	117	72½	81

Average results of five experiments :

Varieties.	Yield of green crop per acre.	
	1894, five tests.	Average, 3 years, 12 tests.
	tons.	tons.
Salzer's Dakota	6.13	6.4
Golden Wonder	5.7	5.4
Common	4.0	4.1
Hungarian Grass	3.3	...

Conclusions.

1. The average number of days from the time of seeding until that of harvesting of the different varieties was as follows : Golden Wonder, 100 days ; Salzer's Dakota, 96 ; Common, 75 ; and Hungarian Grass, 75.

2. The Salzer's Dakota millet gave an average increase of green fodder of 55.8 per cent. in 1892, 53.6 per cent. in 1893, and 53.2 per cent. in 1894 over that of the common millet in the co-operative experiments.

3. The Salzer's Dakota millet possesses a strong stem, a large amount of leaves, and has the tallest growth of the varieties tested.

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 lb. of lucerne in the same way as you would red clover.
(4) If there is a heavy crop of lucerne in the autumn, cut high ; if the crop is light, leave uncut.

Average results of 27 experiments with lucerne seeded in the spring of 1894 :

Lucerne.	1894, 27 tests.	Average 3 years, 58 tests.
Number of days for seed to germinate	10.0 days	10.9 days
Average height of crop in autumn (1st year)	11.9 inches	12.2 inches

The lucerne seed was sown broadcast at the rate of 18 pounds per acre. The seed was obtained in Ontario. In most instances no grain crop was grown with lucerne.

Conclusions.

1. The average number of days for the seed to germinate, and the average height of crop in the autumn for 1894, were quite similar to the results of 1893 and 1892.

2. A large crop of lucerne cannot be expected during the same season in which the seed is sown.

3. Marked variations are noticeable in the growth of lucerne upon different soils of the province.

Individual results of twenty-seven experiments with lucerne :

Experimenter.	County.	Nature of soil.	Nature of subsoil.	Character of drainage.	Remarks.
R. Findlay	Algoma	sandy loam	hard clay	natural	The first part of season it grew very well, but seemed to wither away last part.
R. Deelbridge	Huron	clay loam	clay	....	Started to grow very rapidly, then dry weather set in, then grasshoppers.
Geo. W. Maxwell	Peel	sandy loam	gravelly	good natural	Almost decided to cut down or plow up, but late rains improved greatly.
Thos. G Patton	Halton	"	clay	surface sloping	It made a very short growth, but there is a good root for next year.
Abram Rowand	Bruce	"	sand	natural	I cut the lucerne on 28th July, as it was flowered out and appeared to be ripening. There was about 7 cwt. of green grass came off it.
D. A. Stirton	Middlesex	medium clay	sand	self-draining	
Crawford Scott	Stormont	black loam	clay	Surface drainage	I cut a heavy crop off the land seeded in 1893, and it had splendid after-grass.
W. S. Scott	Stormont	black clay	clay	none	The lucerne I sowed in 1893, I cut July 22. It was heavy and grew up again about 12 inches. I pastured it and it grew up the third time about 8 inches.
Gordon Young, jr	Huron	loamy clay	light	natural good	Lucerne started well, as also did the weeds. The weather in July being very dry the weeds got ahead of lucerne, which was very short. About the end of July I ran the mower over it to stop the weeds from seeding. The wet weather has started the lucerne, and think it will come all right yet.
Thos. W. Hamilton	Russell	red clay	gravel	well drained	Grew well, cut three times. Is getting pretty thick, covering the ground.
W. K. Foreman	Muskoka	sandy loam	clay	natural	Came up well and roots about 12 inches long, but seemed to stand still.
G. Butler	Lambton	clay loam	clay	underdrain	Lucerne grew well until the middle of July, when the drouth set in, and it grew no more until the rains of Sept. 10th ; since then it is growing rapidly.
					Owing to the extra drouth in August the lucerne has not grown after cutting.
Alf. Brown	Addington	fine loam	sand	natural good	About 10 inches high this fall, although hindered much in growth by dry weather.
C. M. Macfie	Middlesex	sandy loam	sandy	tile	The dry weather nearly killed the crop, until the rains came, and clover came up well and it is now doing nicely. I have cut weeds off and it looks well.
Jas Cruickshanks	Kent	sandy	sandy	open ditch	
W. S. Fraser	Simcoe	clay loam	clay	fair	
Wm. Irvine	Grey	sandy loam	sand	natural drainage	During the drouth in June, July and August it withered and the weeds got up, but since the rain came it has again made some progress and is quite green and about 7 inches high on October 3. Do not consider it a success.
Geo. P. Sills	Addington	sandy loam	gravel	side hill	
A. R. Hodgins	Stormont	"	sand	surface	
O. M. Rombough	"	loam	sandy	natural surface	
Robt. McDonald	Glengarry	sandy loam	gravel	natural	Owing to drouth which continued from middle of April to the end of May, germination was slow, in fact the plants seemed to be weakened.
W. J. Brown	Prescott	"	sandy loam	good	Grew nicely, but weeds got the lead and nearly choked out the clover. I think it would not be as profitable for the farmer as Alsike or Vermont.
Jas. Tesky	Addington	clay loam	clay shale	natural. Too dry	Had not the season turned out too dry I would have had a second excellent crop. Under adverse circumstances it has made a growth of 6 and in spots 8 inches.
A. S. Hodgins	Stormont	sandy loam	sand	surface	I think it will prove a valuable crop in this district.
C. D. Lawrence	Parry Sound	"	building sand	surface	
Joshua Knight	Frontenac	clay loam	clay	natural good	
A. Quinn	Perth	rich clay loam	hard fine sand	fair	

V. TESTING SIX LEADING 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 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 condition of field corn, or when the grain is partly glazed.

(7) It is of the utmost importance that all the varieties be sown, and that the weighings be correctly made and carefully recorded.

Individual results of 21 experiments :

Experimenter.	County.	Date of planting.	Nature of soil.	Cropping of 1893.	Weight of whole crop per plot.					
					Cloud's Early Yellow.	Mammoth Cuban.	Salzer's North Dakota.	Wisconsin Earliest White Dent.	Compton's Early.	Early White Flint.
					lb.	lb.	lb.	lb.	lb.	lb.
Geo. A. Snyder	Lincoln	June 9	black loam	hay	120	100	75	65	60	50
Harry E Beamer	Norfolk	" 12	heavy sandy loam	wheat	160	200	75	90	75	110
C. A. Keil	Kent	May 11	sandy loam	wheat & corn.	206	185	162	161	124	141
David N. McCallum	Middlesex	June 6	clay loam	corn	145	125	90	95	85	85
T. A. Cox	Brant	" 12	"	peas	200	180	175	130	116	117
Byram Roblin	Lennox	May 5	"	sod	205	237	200	197	183	96
Joshua Knight	Frontenac	" 15	dark loam	corn	400	420	220	340	225	210
Jno. Datton	Simcoe	June 8	clay loam	turnips	215	178	192	137	154	142
Nelson Gies	Waterloo	" 8	a dark, loamy soil	oats	220	114	185	117	101	127
Jas. Pate	Brant	" 8	soft clay loam	potatoes	244	216	191	189	189	146
Hugh McPhee	Huron	May 22	clay loam	vegetables	204	152	178	114	160	132
H. L. Beckett	Wentworth	June 21	"	oats	161	158	150	102	80	122
Robt. Shaw	Durham	" 2	sandy loam	barley	357	297	287	225	262	175
Jno. W. Richardson.	Haldimand	" 12	clay loam	wheat	297	308	228	211	223	287
Thos. McAfee	Grey	" 1	light loam	spring wheat.	90	82	75	72	68	70
W. H. Clubine	York	" 19	clay loam	oats	165	150	142	90	120	145
Robt. Watson, jr	Grey	" 8	limestone loam	"	945	960	630	780	475	525
Chas. Young	Algoma	" 10	light loam	barley	525	360	442	361	440	355
Alex. Wood	Oxford	" 15	rich clay loam	potatoes	189	130	105	80	88	89
Jno. McKee	Oxford	May 31	clay loam	roots	387	375	250	225	200	212
J. D. Stewart	Perth	June 26	"	green fodder	170	148	103	102	96	96

Average results of 21 experiments :

Varieties.	Average of 21 co-operative tests, 1894.		Experimental Farm test, average of 4 years.		Sections of Ontario for which the corns are best adapted.
	Green ears per acre.	Whole crop per acre.	Whole crop per acre.	Stage of maturity when cut.	
	tons.	tons.	tons.		
Cloud's Early Yellow	4.1	21.4	20.1	late milk	Southern.
Mammoth Cuban	4.0	19.3	18.0	dough	Central to southern.
Salzer's North Dakota	3.8	15.8	17.0	firm dough.	Central to northern.
Wisconsin Earliest White Dent.	3.8	14.8	15.9	firm dough.	Central.
Compton's Early	3.4	13.4	15.0	ripe	Northern.
Early White Flint	3.4	13.1	13.3	ripe	Northern.

Conclusions.

1. The comparative order of the different varieties in yield of whole crop per acre was the same in the average of 21 co-operative experiments in 1894 and in the average of the Experiment Station tests for four years.

2. The greatest number of well developed ears was produced by the Salzer's North Dakota and the Early White Flint; and the least number by the Cloud's Early Yellow.

3. The Cloud's Early Yellow and the Compton's Early gave the largest number of inferior ears.

4. The Cloud's Early Yellow and the Mammoth Cuban grew to the greatest average height and the Early White Flint to the shortest height.

5. The individual experiments show that no one variety of corn is equally well suited to all parts of Ontario.

VI. TESTING FIVE VARIETIES OF TURNIPS.

(1) Five plots, each containing 272 square feet, are required for the experiment with turnips.

(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 ten inches apart.

(6) Be careful of the plants when cultivating and hoeing the ground.

(7) It is of the utmost importance that the five varieties be grown in every case, and that all weighings be accurately made and carefully recorded.

(8) In harvesting the plots, watch carefully the requirements of the blank form below.

Individual results of eighteen experiments:

Experimenter.	County.	Nature of soil.	Cropping of 1893.	How and when last manured.	Yield of turnips per plot. Jersey Navet.	Early American Red Top.	Carter's Elephant.	Hartley's Bronze Top.	Carter's Prize Winner.
					lb.	lb	lb.	lb.	lb.
Herbert Watson	Peel	clay loam	peas		401	290	274	254	245
J. Knight	Frontenac	"	potatoes	1894, b. y. m.	422	540	510	380	385
C. D. Lawrence	Parry Sound	sandy and clay loam	"	1893, b. y. m.	354	350	200	328	265
J. F. Mannen	Wentworth	sandy loam	"	1894, b. y. m.	685	728	620	535	640
Angus Munro	Parry Sound	clay loam	buckwheat	1892, b. y. m.	304	360	214	239	354
Jas. F. Knapp	Frontenac	"	mixed peas and oats	1893, b. y. m.	295	169	256	325	325
Adam Betz	York	"	peas	1893, b. y. m.	725	426	368	453	370
M. Fraser	Perth	sandy loam	none for 10 years	1894, b. y. m.	325	280	300	290	300
T. A. Walker	Wentworth	"	barley		190	216	230	225	220
Jas. B. Muir	Bruce	"	buckwheat	1894, b. y. m.	323	244	183	222	200
W. D. Ventress	Peterboro'	"	turnips	1894, b. y. m.	570	422	346	231	242
F. Foyston	Simcoe	clay loam	oats	1893	218	290	222	237	192
Benson J. Wallace	Wellington	"	oats	1893, b. y. m.	690	630	570	490	510
C. A. Kincaid	Leeds	"	corn	Pasture land	320	370	279	256	180
Michael Schuerter	Bruce	sandy loam		1894	338	316	174	224	175
Geo D. McMillan	Ontario	loamy	oats	*	276	251	211	197	186
R. Findlav	Algoma	sandy loam	peas	1894	375	390	450	395	400
A. G. McKenzie	Perth				391	265	171	177	168

* Plowed in crop of green clover in 1889.

Average results of eighteen experiments:

Varieties.	Average yield per acre.		
	18 co-operative tests, 1894.	Experimental Farm tests, 4 years.	Experimental Farm dry matter, 1894.
	tons.	tons.	tons.
Jersey Navet	32.0	24.2	1.51
Early American Red Top	29.1	23.6	1.28
Carter's Elephant	24.8	19.0	1.00
Hartley's Bronze Top	24.3	23.1	1.12
Carter's Prize Winner	23.8	21.5	.71

The Jersey Navet and the Early American Red Top turnips are both fall varieties, and the Carter's Elephant, Hartley's Bronze Top and Carter's Prize Winner are all Swede varieties. Prof. Shuttleworth determined the amount of dry matter of the turnips which were grown in the college plots in 1894. The amount of dry matter per acre being represented in the right hand column of the summary above.

Conclusions.

1. The fall turnips gave a greater yield of roots per acre than the Swede varieties in the co-operative tests of 1894.

2. The Jersey Navet gave the largest yield of roots per acre in the co-operative tests for both 1893 and 1894 and in the College tests for the past four years.

3. The Jersey Navet was spoken of by nearly all experimenters as being a more desirable variety than the Early American Red Top.

4. The Carter's Elephant Swede made rather higher results comparatively in 1894 than in 1893.

VII. TESTING FIVE VARIETIES OF MANGELS.

Instructions.—Same as those given for turnips.

Average results for thirty-four experiments:

Varieties.	Average yield per acre.		
	34 co-operative tests, 1894.	Experimental Farm tests, 4 years.	Experimental Farm dry matter, 1894.
	tons.	tons.	tons.
Long Red Selected	32.5	22.2	3.22
Giant Yellow Intermediate	29.9	22.8	3.10
Mammoth Red Intermediate	27.4	20.1	2.60
White Silesian Sugar Beet	25.2	18.9	3.11
Warden Prize Orange Globe	20.9	15.7	2.89

There were four varieties of mangels and one variety of sugar beets tested in 1894. These were grown at the College, and the amount of dry matter in each variety determined in the chemical laboratory by Prof. Shuttleworth. The yield per acre on the College plots, multiplied by the percentage of dry matter in each variety, gives the results which are found in the right-hand column of the above summary.

Individual results for thirty-four experiments :

Experimenter.	County.	Nature of soil.	Cropping of 1893.	When and how last manured.	Yield of mangels per plot. Long Red Selected.	Giant Yellow Intermediate.	Mammoth Red Intermediate.	White Silesian Sugar Beet.	Warden Prize Orange Globe.
					lb.	lb.	lb.	lb.	lb.
Jno. Hamilton	Simcoe	sandy loam	turnips	1890	275	245	215	210	185
Wm. Wilson	Bruce	loam	barley	1894	540	710	780	445	550
Adam Betz	York	clay loam	peas	1893, b. y. m.	472	538	294	286	241
J. Knight	Frontenac	"	potatoes	1894, b. y. m.	620	618	560	343	480
W. Hyde	Perth	"	"	1894, cow manure	372	306	278	250	294
Jno. Jas. Burns	Victoria	"	"	1893, b. y. m.	668	609	520	543	443
F. McN. Ward	Parry Sound	"	"	never	304	324	245	195	263
T. J. M. Skelly	Simcoe	sandy loam	peas and oats	1894, b. y. m.	372	456	349	439	230
A. Wiancko	Muskoka	clay	turnips and carrots	1893	130	203	173	175	156
W. V. Nigh	Middlesex	clay loam	millet	1894, b. y. m.	299	300	235	284	190
Martin Johnston	Simcoe	sandy	oats	1894, b. y. m.	147	220	275	328	137
Andrew Chisholm	Waterloo	sandy loam	potatoes	1893, b. y. m.	231	248	198	200	300
J. H Garbutt	Peterboro'	light clay loam	buckwheat	1894	175	182	134	135	115
Jno. Edwards	Lambton	clay loam	oats	1892, b. y. m.	275	253	203	190	200
Walter Hick	Huron	dark clay loam	oats	1894, b. y. m.	228	240	150	180	120
Arthur Ribble	Elgin	clay	summer fallow	1894	510	370	520	470	200
R. E. McKee	Peterboro'	clay loam	wheat and roots.	1894	215	241	244	194	225
Jas. Laurie	Kent	black loam	potatoes	new land	600	512	325	400	300
Chas. Madden	Bruce	clay loam	"	1894, b. y. m.	668	476	452	560	368
Edgerton Roe	Huron	muck	oats	1894	515	400	490	350	300
Don. McDiarmid	Kent	black clay loam	potatoes	never	588	480	448	380	260
Jas. Smith	Lambton	sandy loam	"	1893	266	240	208	245	230
E. B. Yarwood	Pr. Edward	"	buckwheat	1894	220	232	156	127	112
Richard Stutt	Lambton	clay loam	fall wheat	1894, b. y. m.	570	306	282	350	198
Robt. Edge	Grey	light clay	carrots	1893	327	228	183	347	187
Wm. Aitchison	Huron	clay loam	oats		339	154	270	276	102
Wm. H. Briston	Simcoe	clay loam	turnips	1893	765	600	550	715	420
Aaron Wismer	Lincoln	sandy loam	sugar beets	1892, b. y. m.	278	435	310	268	271
Robt. Currie	Lambton	clay loam	meadow last two years	1894, hog m.	540	400	410	360	320
Jas. D. Hutton	Victoria	sandy loam	fall wheat	1894, b. y. m	675	620	600	210	326
Geo. Hodgins	Stormont	"	oats	1893, b. y. m.	280	340	315	180	244
O. M. Rombough	"	light loam	hay	1894, b. y. m.	266	306	284	174	230
Nicholas Dehart	Simcoe	light clay loam	peas	1894	497	431	509	441	322
T. C. Ponting	Shelby, Ill.	prairie loam	carrots and corn		573	486	475	447	351

Conclusions.

1. The Steele Bros. Long Red Selected Mangel gave the highest yield of roots per plot in 8 of the co-operative experiments out of ten conducted in Ontario in 1892, 11 out of 18 conducted in 1893, and 16 out of 34 conducted in 1894.

2. The White Silesian Sugar Beet holds the same relative position among the mangels in yield per acre in 1894 as it did in 1893.

3. The yield of dry matter per acre in the experiment at the College in 1894 shows the highest results from the Steele Bros. Long Red Selected mangel and the White Silesian Sugar Beet, and the lowest results from the Warden's Prize Orange Globe and the Mammoth Red Intermediate varieties of mangels.

VIII. TESTING FIVE VARIETIES OF CARROTS.

INSTRUCTIONS.—Same as those given for turnips.

Individual results of twenty-nine experiments:

Experimenter.	County.	Nature of soil.	Cropping of 1893.	How and when last manured.	Yield of roots per plot. Improved Short White.	Large White Vosges.	Large White Belgian.	Guerande.	Danver's Half Long Orange.
					lb.	lb.	lb.	lb.	lb.
Jas. W. Fisher & Son	Norfolk	sandy loam	melons & onions	1893, b.y.m.	610	605	595	555	490
T. J. M. Skelly	Simcoe	"	peas and oats ..	1894, b.y.m.	686	522	367	411	293
J. F. Mannen	Wentworth.	"	potatoes.......	1894, b.y.m	450	430	410	445	435
C. D. Lawrence	Parry Sound	s'ndy & clay loam	"	1893, b.y m.	350	342	278	265	280
J. Knight	Frontenac..	clay loam	"	1894, b.y.m.	385	410	390	360	410
Wm. Wilson	Bruce	sandy loam	"	1894........	556	668	768	750	749
A. Wiancko	Muskoka ..	hard clay	peas	1894........	60	39	41	68	50
Angus Munro	Parry Sound	clay loam	buckwheat	1892........	398	378	394	385	380
Adam Betz	York	"	peas	1893, b.y.m.	336	246	275	318	261
Jas. Hill	Lincoln	sandy loam	mangels	1894	63	73	64	49	59
Jonathan Cross	Prescott....	"	roots and corn..	1894 b.y.m.	344	288	304	344	296
Robt. Cinnamon....	Dundas	clay loam ..	wheat	1894, b y.m.	260	280	260	300	250
R. O. Smith........	Middlesex..	"	potatoes	1894, b y.m.	402	450	418	364	278
Jos. W. Newman ..	Grenville...	sandy loam	"	1893, b.y.m.	380	365	370	290	310
J. H. Osborne	Muskoka...	"	onions..........	....	309	397	351	361	330
Jas. Bell	Lanark	clay loam	turnips	1893, b.y.m.	370	321	324	338	286
Edwin Chambers ...	Welland ...	muck	"	....	243	223	275	248	240
Jas. A. Chisholm...	Waterloo ..	sandy loam	wheat	1893, b.y.m.	310	201	249	165	121
Jno. P. Rutherford.	Algoma	clay loam	carrots	1893, b.y.m.	225	197	206	173	168
R. Ewens	Grey	"	potatoes	1893, b.y.m.	602	434	451	356	403
Wm. Ireland	Parry Sound	sandy	"	1894, b.y.m.	720	600	480	900	900
P. S. McLaren......	Lanark ...	sandy loam	"	1894, b.y.m.	388	300	243	292	237
D. Macfarlane......	Parry Sound	clay loam	corn	1893, b.y.m.	410	460	408	370	390
Chas. Collins	Victoria....	sandy loam	mangels	1892, b.y.m.	550	420	520	320	336
Wm. Stitzinger	Welland ...	light sand	fall wheat	1891, b.y.m.	464	500	400	480	420
Jos. Abell..........	Lambton ..	dark loam	potatoes	1893	702	650	714	420	540
L. Dillabough	Dundas	loam	oats	1893, b.y.m.	595	480	570	450	450
T. C. Ponting	Shelby Co., Ill	prairie loam....	carrots and corn.	....	344	273	290	192	173
Jno. B. Landon	Leeds	sandy loam	potatoes	1894, b.y.m.	456	424	392	264	264

Average results of twenty-nine experiments:

Varieties.	Average yield per acre. Twenty-nine co-operative tests, 1894.	Experimental Farm tests, three years.
	tons.	tons.
Improved Short White	33.0	32.9
Large White Vosges	30.3	28.9
Large White Belgian.......	29.8	25.4
Guerande	28.2	21.5
Danver's Half Long Orange	27.0	24.6

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, in 42 per cent. of the co-operative experiments in 1893, and in 55 per cent. of the co-operative experiments during 1894.

2. The White Fleshed varieties of carrots all gave better yields of roots than the Yellow Fleshed varieties in both 1894 and 1893.

3. The Guerande was the easiest to remove from the ground, and the Large White Belgian the hardest of all the varieties tested.

IX. TESTING FIVE VARIETIES OF SPRING WHEAT.

(1) Select a portion of uniform soil and mark off five plots, for either spring wheat or barley, six plots for 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.
(5) In harvesting the plots, watch carefully the requirements of the blank forms on this page.
(6) It is of the utmost importance that all the varieties in the particular experiment chosen be sown, and that the weighings be correctly made and carefully recorded.

Individual results of nineteen experiments :

Experimenter.	County.	Nature of soil.	Cropping of 1893.	When and how last manured.	Yield of grain on plot. Herison Bearded	Hayne's Blue Stem.	Manitoulin.	Pringle's Champion.	Red Fern.
					lb.	lb.	lb.	lb.	lb.
G. Sutherland	Lanark	loam	corn	1893	5	5	3	3	3
Geo. Luxton	Grey	clay loam	potatoes	1893, b.y.m.	8.5	10	8	8	9
Chas. Bard	Muskoka	sandy loam	clover	1891, b.y.m.	4	4	4.2	4.7	6.1
Geo. Gatecliffe	Lambton	clay loam	potatoes	1893	13	8	7	10	8
W. J. Falconer	Dufferin	"	"	1893, b.y.m.	8	10.5	10	8	8
J. R. Maddock	Simcoe	"	spring wheat		8	9	8	10	8
Hiram Moses	Wellington	"	potatoes	1893, b.y.m.	9	12	8	11	9
Thos. Stephenson	Grey	gravel mixed with clay	"	1893, b.y.m.	4.5	5.8	4.8	6	6.3
Bernard Kelly	Simcoe	clay	peas	1890, b.y.m.	7.5	5.3	5	6	5.5
Jas. Rea	Victoria	clay loam	wheat	1890	6	4	6	6	7
W. J. Dunn	Simcoe	"	none	never	12	10.3	9	7	8.5
Jno. Hunt, jr	Simcoe	"	fall wheat	1889, b.y.m.	8	5	7	5	5
Fred. J. Macklin	Northuml'd.	loam	peas	1889, b.y.m.	2	3.5	2.8	1.8	2.8
No name		dark clay loam	barley	1894	7.3	8	7.5	7	6.5
Jas. Henderson	Hastings	clay loam	potatoes	1893, b.y.m.	4.5	3	5	4.5	4.5
Angus Munro	Parry Sound	"	oats	never	5.5	5.3	5	5 8	6
Sid. H. Tripp	Welland	clay	mangels		4	1.5	1.8	1.6	3
Wm. C. Wilson	Simcoe	clay loam	peas	1894	8.3	6.8	7.6	6.7	6.8
J. Kerr	Prince Ewd.		potatoes	1893	8.5	9	12	8	6

The Herison Bearded variety of spring wheat was imported from France by the Agricultural College in the spring of 1889, and the Pringle's Champion was imported from Germany in the same year. The Haynes Blue Stem was sent from the North Dakota Agricultural Experiment Station in the spring of 1892. It was a variety which proved the best among a great many tested at the Experiment Station.

The Manitoulin and the Red Fern are both Ontario varieties.

Average results of nineteen experiments :

Varieties.	Yield per acre. Straw. Nineteen tests, 1894.	Straw. Exp. Farm tests, three years.	Grain. Nineteen tests, 1894.	Grain. Exp. Farm tests, three years.
	tons.	tons.	bush.	bush.
Herison Bearded	1.6	2.3	18.8	32.0
Hayne's Blue Stem	1.5	1.9	17.7	27.0
Manitoulin	1.5	1.9	17.0	26.4
Pringle's Champion	1.6	2.2	16.9	30.4
Red Fern	1.6	2.4	16.7	33.5

Conclusions.

1. The Herison Bearded heads the list in yield of grain per acre in the average of twenty-nine co-operative experiments in 1893, and of nineteen co-operative experiments in 1894, and also in the College tests with spring wheat for the past six years.

2. The Hayne's Blue Stem, which stood second in average yield per acre over Ontario in 1893, holds the same place relatively among the varieties tested in 1894.

3. The Red Fern, which is a well known variety in many parts of Ontario, gave the lowest average yield of grain per acre in 1894, and second lowest in 1893.

4. The Hayne's Blue Stem variety was the freest from rust among the five kinds tested over Ontario in 1894.

X. TESTING FIVE VARIETIES OF BARLEY.

Instructions.—Same as those given for spring wheat.

Average results of 28 experiments :

Varieties.	Yield per acre. Straw. 28 tests, 1894.	Straw. Exp. Farm tests, 5 years.	Grain. 28 tests, 1894.	Grain. Exp. Farm tests, 5 years.
	tons.	tons.	bush.	bush.
Mandscheuri	1.6	1.8	38.6	68.5
Black Hulless	1.4	1.7	30.1	50.5
Kinna Kulla	1.6	1.6	27.7	59.2
Duckbill	1.7	1.7	27.3	50.7
Hungarian	1.6	1.6	25.3	45.3

The Mandscheuri barley was imported from Russia, the Kinna Kulla from Sweden, and the Hungarian from Hungary, in the spring of 1889. The Black Hulless and the Duckbill are both Ontario varieties. Of the five varieties used in this experiment, the Mandscheuri is a six-rowed variety, the Black Hulless and Hungarian are hulless, and the Kinna Kulla and Duckbill are two-rowed varieties.

Individual results of 28 experiments :

Experimenter.	County.	Nature of soil.	Cropping of 1893.	How and when last manured.	Yield of grain on plot.				
					Mandscheuri.	Black Hulless.	Kinna Kulla.	Duckbill.	Hungarian.
					lb.	lb.	lb.	lb.	lb.
Michael Addis	Simcoe	a rich clay loam.	oats	never	14	10	6	5	4.5
Wm. Ireland	Middlesex	clay	"	pasture	12	6.3	5	7.5	6
Otto Mosser	Wellington	clay loam	roots	1892, b.y.m.	24	14	12	13	9
Wm. McKenzie	Perth	"	potatoes	1892	16	7	8	9	10
Jas. Pegg	Grey	sandy loam	oats	1893	14.3	10.9	9.2	11.1	9.3
Jno. E. Rice	Lanark	sandy and clay	fall wheat	1892	5	5	4	3.1	2.8
E. A. Maddock	Simcoe	clay loam	spring wheat	1893	22	17	16	16.5	14
Dan. Madden	Bruce	"	bare fallow	1893, b.y.m.	12	9	9.5	10	10.5
Thos Gadd	Grey	"	potatoes	1893, b.y.m.	8	8	5	6	4
D. H. McDougall	Glengarry	clay	mixture of oats and barley	1883, b.y.m.	9	6	17	8	9
Geo. Hood	Huron	clay loam	potatoes	1894, sheep m	13	8.5	8	7.5	12
Jas. Smith	Bruce	"	turnips	1893, b.y.m.	3.8	4.3	3.3	4.5	3.5
Geo. W. Beckett	Welland	"	winter wheat	1892, b.y.m.	8.5	8.5	5	6	8
R. Braithwaite	Lambton	"	corn		14	13	10	11	10
Jno. White	Kent	black clay	fall wheat	never	12	9.5	10	10	9
Simon Burns	Lambton	clay	roots		13	12	11.5	10.5	14.5
Jno. G. McKay	Bruce	clay loam	peas		19.3	14	11.3	10.8	12
Dan. Marshall	Grey	"	turnips	1893	10.5	8	9	10	7.5
Alex. S. Weir	Muskoka	sandy loam	potatoes	1893, b.y.m.	5	8	7	6	5
Jno. Armbrust	Welland	black loam	oats		9	8	9	4	7
W. R. McGarry	Lanark	clay and gravel.	"		9.5	7.8	2	2	1.3
P. R. Longworth	Kent	black, heavy clay	fall wheat	never	8.8	11.3	6.5	6.8	7.5
W. J. Hunt	Parry Sound	sandy loam	peas	1894, b.y.m.	12	5	7.8	7.8	4.8
Wesley Buskin	Grey	clay loam	"	1890, b.y.m.	12	15	7	8	6
David Armstrong	Lambton	sandy loam	potatoes	new land	8	7	9	12	9.5
Chas. Irwin	Huron	dark	corn		8.3	5.3	7.3	6	2.3
F. A. Whetter	Victoria	clay loam	oats	1894	9	7	5	9	7.5
Geo. North	Wellington	sharp clay loam	peas	1894	12	8	12.5	8	6

Conclusions.

1. The Mandscheuri variety of barley gave the highest yield of grain per acre in the co-operative tests for 1892, 1893 and 1894.

2. The six-rowed varieties of barley have surpassed the two-rowed and the hulless varieties in the co-operative experiments over Ontario, for three years in succession.

3. The Mandscheuri barley was surpassed by no other variety in 75 per cent. of the co-operative experiments over Ontario in 1894.

4. The Mandscheuri variety of barley was the freest from rust, and the Duckbill the second freest from rust of the five varieties tested over Ontario in 1894.

5. The average yield per acre of barley in the tests at the Agricultural College for five years is about double that given in the co-operative experiments over Ontario in 1894.

XI. TESTING SIX VARIETIES OF OATS.

INSTRUCTIONS—Same as those given for spring wheat.

Individual results of 121 experiments:

Experimenter.	County.	Nature of soil.	Cropping of 1893.	How and when last manured.	Yield of grain on plot. Siberian.	Poland White.	Joanette.	Bavarian.	Lincoln.	White Schonen.
					lb.	lb.	lb.	lb.	lb.	lb.
Wm. Field	Middlesex	h'vy cl. loam	fall wheat	1893	12.0	10.0	10.5	10.0	9.0	9.0
John Foulkes	Muskoka	clay loam	peas	1893, b.y.m.	12.5	11.0	10.0	13.5	10.0	11.5
John A. Sexsmith	Peterborough.	sandy loam.	potatoes	1892, b.y.m.	13.3	14.5	9.5	13.3	10.0	9.5
F. H. Clark	Lambton	clay loam		1893, b.y.m.	8.5	13.0	10.5	11.8	9.0	11.5
P. Smith	Perth	"	pasture	4 years ago	17.8	11.8	16.0	11.8	10.8	11.8
Wm. Flynn	Simcoe	"	fodder corn	1893, b.y.m.	8.5	10.5	9.0	11.0	12 0	11.5
George R. Bell	Northumberl'd	"	beans	1893	15.8	13.5	14.0	12.3	12.8	14.0
Jno. F. Campbell	Dundas	"	wheat	1892, b.y.m.	12.5	8.5	10.8	11.3	7.8	8.3
John Wetheral	Ontario	black muck	meadow	never	7.0	8.0	8.0	7.0	9.0	7.0
John Bell	Grey	clay loam	potatoes	never	11.3	9.8	9.6	10.2	10.2	9.3
E. W. Tufgor	Wentworth	muck	willows and cattails	never	7.0	8.0	9.0	6.0	7.0	6.0
V. Springsteen	Kent	clay loam	corn		8.2	8.3	7.8	6.5	7.0	7.5
John McKessock	Grey	lt. clay loam	peas	1889	6.5	7.0	7.0	7.0	9.0	6.0
Dun. McVannell	Perth	clay loam	pasture	none	7.0	8.0	10.0	6.0	7.5	8.0
Matthew Dykes	Victoria	sandy loam	barley	1892	20.0	22.0	17.0	24.0	20.0	19.0
Louis Adolph	Perth	black loam	oats		10.0	14.5	9.0	10.0	9.5	9.5
Edmund E. Cook	Dufferin	sandy loam	rape	1893, b.y.m.	16.0	13.0	16.0	12.0	12.0	14.0
O. H. Coulter	York	black loam.	oats		8.5	9.0	9.5	10.0	9.0	8.0
Paul Scott	Peterborough.	clay loam	roots	1893, cow m	14.0	15.0	14.0	16.0	17.0	13.0
L. Stoutenburgh	York	"	fall wheat	1892, b.y.m.	11.5	20.5	23.5	12.0	12.5	7.0
George Jackson	Huron	light loam	potatoes	1893	10.0	13.0	9.0	8.0	7.0	8.0
Wm. C. Wilson	Simcoe	clay loam	peas	1894	10.5	9.8	11.3	8.4	9.5	10.0
M. Addis	Simcoe	"	oats	never	12.0	14.0	12.0	12.0	11 5	11.0
Thomas Henry	Kent	"	corn		8.0	12.0	12.5	9.0	11.5	11.0
Wm. J. Cook	Monck	sandy loam	hay	never	3.5	4.0	4 5	3.0	4.3	3.0
Wm. H. Gervin	Norfolk	"	corn	1893, b.y.m.	9.3	8.3	8.0	8.3	7 0	7.8
A. T. Horne	Ontario	clay loam	corn	1893, horse m.	13.8	16.3	12.5	14.0	10.8	13.0
Richard Connolly	Oxford	"	corn	1893, b.y.m.	9.0	9.0	10.0	8 0	7.0	10.0
John B. Stone	Northumberl'd	"	peas	summer fallow	14.0	12.0	10.5	13.0	11.5	11.5
Jos. Martineau	Prescott	"	oats & barley.	1894	7.0	5.5	7.3	7.5	7.5	6.0
J. B. Lindsay	Huron	clay	potatoes	1893, b.y.m.	13.5	12.5	14.0	13.5	14.0	14.0
F. A. Whetter	Victoria	clay loam	oats	1894	11.5	13.0	13.5	11.0	11.5	12.0
J. H. Schweyer	Haldimand	stiff clay	timothy hay	1888	5.0	5.5	4.0	5.0	6.0	5.0
James Brodie	Grey	clay loam	potatoes	1893, b.y.m.	16.0	17.0	15.0	16.0	16.0	14.0
Henry Miller	York	heavy clay	roots		10 0	16.0	16.0	9 0	9.0	8.0
George Brent	Lambton	clay loam	barley	1892	15.5	13.5	12.0	15.3	13.5	15.4
A. Waldie	Halton	"	potatoes	1893, b.y.m.	17.0	16.0	17.5	16 5	13 5	13.3
Wm. Miller	Bruce	"	peas	not lately	18.0	19.0	15.0	24.0	20.0	18.0
George Nixon	Durham	loam	wheat		9.0	7.0	8.0	9.0	7.0	8.0
D. McEwen	Renfrew	clay loam		never	6.5	9.5	5.0	6.0	9.5	6.0
Wm. Simpson	Kent	sandy loam	corn	1891	15.0	15.0	14.0	21:0	16.0	15.0
H. P. Jeffrey	Essex	blk sandy lm	corn	1894	13.5	8.0	12.5	9.5	14.0	13.5
John Priddle, jr.	Norfolk	sandy loam	wheat	1892, b.y.m.	5.5	6.0	8.5	6 0	5.0	7.0
W. J. Wilson	Dundas	clay loam	turnips, beans.		10.0	8.5	9.0	10.0	8.3	8.0
Hobart Morton	Carleton	sandy loam	hay	1889, b.y.m.	6.0	6.0	4.5	4.0	4 5	3.8
W. M. Comfort	Monck				11.0	11.0	8.0	7.0	8.0	7.0
W. J. Standen	Simcoe	sandy loam	potatoes	1892, b.y.m.	8.0	7 5	10.0	6.5	9.5	13.5
Thos. W. Klinck.	York	blk clay lo'm	potatoes	1893, b.y.m.	19 5	12.0	20.0	12 5	12 5	17.0
Wm. Fitzgerald	Bruce	"	pasture	1891, b.y.m.	7.5	7.0	17.0	13.5	16.0	8.0
Nichol Dawson	Northumber'd	clay loam	potatoes	1893	10.8	11.3	12.5	10.0	12.0	9.8
C. W. Otis	Oxford	sandy loam	potatoes, cabge	1893, horse m.	5.5	5.5	5.0	4.0	7.0	5.0
Cor. Ketchabaw	Elgin	hard clay	wheat	1892	4.3	6 0	5.5	6.8	6.5	6.0
J. Davidson	Bruce	clay loam	corn	1893, b.y.m.	10.8	11.5	11.0	11.8	10.0	10.5
T. F. Howell	Brant	mild loam	corn	1893, b.y.m.	14.0	11.5	10.5	10.0	10.5	13.5
Andrew Murphy.	Dufferin	sandy loam	turnips	1893, b.y.m.	5.0	6.5	5.0	5.0	4.0	4.0
J. Johnston	Dufferin	clay loam	meadow	1888, b.y.m.	14.0	11.5	13.0	12.0	15.0	11.0
W. J. Beatson	York	"	peas		16.5	20.0	14.5	15.0	16.0	11.5
James D. Rose	Wentworth	clay	wheat		7.0	7.0	8.5	7.0	8.0	9.0
John H. Gray	Oxford	clay loam	corn	1893, b.y.m.	8.0	6.0	7.5	6.5	7.0	7.0
Wm. Wood	Simcoe	loam	fall wheat	1892, b.y.m.	10.0	10.0	11.0	8.0	9.0	8.0
Jas. W. Partridge	Simcoe	clay loam	turnips	never	9.0	9.5	9.0	11.0	9.0	9.0

XI. TESTING SIX VARIETIES OF OATS.—*Continued.*

Individual results of 121 experiments.

Experimenter.	County.	Nature of soil.	Cropping of 1893.	How and when last manured.	Yield of grain on plot. Siberian.	Poland White.	Joanette.	Bavarian.	Lincoln.	White Schonen.
					lb.	lb.	lb.	lb.	lb.	lb.
John Phillips	Huron	cl&san. loam	corn	1893, b.y.m.	14.5	8.0	10.0	9.0	10.0	14.0
Chas. Holton	Essex	clay loam	corn	never	15.0	16.2	14.0	17.1	16.8	15.3
Robt. Paterson	Middlesex	dk.clay loam	corn	1893	15.0	12.0	12.0	14.0	14.5	14.0
David L. Graham	Hastings	clay loam	barley	1893, b.y.m. & s. phosp. & salt	14.0	15.0	17.0	13.0	14.0	16.0
Wallace Megraw	Bruce	"	pasture	1888	10.0	9.0	11.0	10.0	10.0	13.0
John Davidson	Lambton	clay	peas	...	8.5	7.0	9.0	7.0	8.0	6.5
Hugh Hunter	Parry Sound	sandy loam	carrots	1893, b y.m.	20.0	17.5	12.5	18.0	17.5	18.5
E. F. Casselman	Parry Sound	clay loam	turnips	never	14.0	15.8	10.5	13.0	14 5	14.0
John Spaulding	York	clay bottom.	potatoes	...	8.0	7.0	6.0	10.0	7.0	4.0
Adam Watson	Muskoka	sandy loam	peas	1894, b.y.m.	4.6	3.9	4.4	5.1	5 1	4.0
Leonard Buckton	Welland	clay loam	wheat	1832, b.y.m.	4.4	5.9	4.3	4.2	4.6	3.3
J. Knight	Frontenac	"	...	...	13.0	12.0	14.0	14.5	13.0	12.0
A. J. Griffith	Carleton	sandy loam	fodder corn	1890	8.0	9.0	6.0	7.0	8.0	5.5
Har. P. Westgate	Lambton	clay loam	wheat	1892, b.y.m.	7.0	6.0	7.0	5.5	5.0	9.0
Abram Schooley	Elgin	sandy loam	fall wheat	6 years' sod	7.3	7.3	14.0	9.3	6.5	12.0
Henry Johnson	Perth	clay loam	mangels	1893	9.5	9.0	13.5	9.0	9.5	10.0
Richard Senior	Wellington	"	potatoes	1894	5.0	9.0	7.0	10.0	11.0	6.0
Wm. Dickson	Perth	"	hay	...	8.0	10 0	10.0	9.0	9.0	13.0
Wesley W. Fisher	Huron	gravelly l'm.	hay	never	5.0	4.0	5.0	6.0	5.0	3.5
John Reid	Algoma	clay	oats	never	8.5	8.0	11.0	10.0	8.0	8.0
Don. Sutherland	Oxford	clay loam	pasture	never	17.0	17.0	11.0	15.5	13.0	13.0
Archie Stewart	Middlesex	rich b'k loam	hay	...	6.0	8.0	7.0	8.0	5.0	5.0
Richard Moore	Frontenac	clay	corn	1893, b.y.m.	12.5	11.0	7.3	8.0	9.5	10.0
Wm. Ramage	Grey	sandy loam	sod pasture	1889, b.y.m.	7.0	7.5	6.3	6.3	5.5	5.0
Theo. Parker	Perth	"	hay	1890	15.0	16.0	10.0	19.0	20.0	24.0
Wm. Wilson	Bruce	clay loam	potatoes	1893	11.0	9.0	11.0	10.0	9.0	11.0
W. J. Westingdon	Northumber'd	"	peas	never	9.0	8 0	7.0	9.5	8.0	7.0
George North	Wellington	blk. cl. loam	turnips	1893	10.0	11.0	12.0	8.0	10.0	12.0
M. Munroe	Glengarry	loam	wheat	1892	5.5	5.0	3.3	4.0	4.8	4.0
Jas. D. Tully	Peterborough	clay loam	potatoes	...	15.0	14 0	15.0	16.0	15.0	14.0
Well. Armstrong	Lambton	sandy loam.	potatoes	new land	9.0	8.5	11.0	10.5	7.0	9.0
Charles McCrae	Huron	clay loam	fall wheat	1894, b y.m.	18.0	16.0	16.0	16.0	20.0	15.0
David Armstrong	Lambton	sandy loam.	potatoes	new land	8.0	9.0	12.0	10.0	10.5	9.0
R. A. Robertson	Durham	fine clay	spring wheat	1893, b.y.m.	16.0	14.5	13.0	17.0	15.0	14.0
J. G. Dickenson	Simcoe	clay loam	spring wheat	1890, b y.m.	11.5	12.0	5.0	9.0	10 0	11.0
Robert Robertson	Simcoe	clay	turnips	1893	9.0	6.0	9.0	8.0	7.0	7.0
D. S. Campbell	Middlesex	gravelly lo'm	fall wheat	1893	18.0	16.0	10.0	17.0	18.0	17.0
Fred. Swaine	Bruce	sandy loam.	oats	previous to '93 by pasturing	5.0	4.5	5.0	5.0	7.0	5.3
George Doe	Elgin	loam	fall wheat	...	9.5	8.5	11 0	9.0	9.5	9.0
Thomas Robson	Oxford	clay loam	fall wheat	1892, b.y.m.	6.0	6.0	6.5	5.5	4 5	5.0
Andrew Timmins	Dundas	sandy loam.	barley	never	13.0	13.5	8.5	14.0	11.0	13.0
John C. Nichol	Middlesex	sandy loam.	oats	1893	11.3	10.5	9.8	10.3	8.3	9.0
Thomas Strachan	Huron	clay loam	peas	1892, fall wheat	10.5	13.0	14.0	13.5	13.5	11.0
Thomas Foulds	Middlesex	"	...	...	8.8	6.0	5.0	8.0	6.0	4.5
W. A. Longworth	Kent	blk hvy clay	fall wheat	never	8 5	10.3	6.5	7.3	10.3	10.5
Andrew Quinn	Perth	clay loam	sod	none for 5 yrs.	9.0	10.0	15.0	8.0	12.0	10.0
Alex. McIntyre	Brant	sandy loam.	winter wheat	1892, b.y.m.	4.0	5.0	4.0	7.0	5.0	6.0
A. Wardrop	Bruce	"	hay	1893	7.0	8.0	8.0	7.5	8.0	6.0
Wm. Kaufman	Oxford	...	...	...	6.5	7.0	8.8	8.0	8.5	5.0
Robert Brock	Lambton	...	...	...	5.5	5.5	3.5	5.5	2.5	5.0
Elmer S. Tucker	Russell	a poor clay	peas	...	8.2	4.7	8.8	7.1	8.0	7.5
W. J. McKinley	Leeds	sandy loam.	clover meadow	1892	8.0	7.0	6.0	12.0	6.0	10.0
R. Cullis	Northumber'd	hvy. cl. loam	turnips	1893	6.0	5.0	5 0	5.5	5.3	5.5
John Stewart	Durham	clay loam	clover meadow	1891, b.y.m.	5.3	4.7	8.0	3.3	6.7	4.7
John L. Eidt	Waterloo	...	...	...	10.5	8.0	10.5	6.5	7.5	7.0
Charles Irwin	Huron	dark loam	brk'n from sod	...	11.3	11.0	11.5	11.5	14.0	10.0
Francis Bole	Grey	loam	peas	1892, b.y.m.	4.5	6.0	5.0	5.5	7.0	5.3
J. Stephens	Simcoe	high cl. loam	...	...	10.0	8.0	9.0	9.5	8.0	11.0
James F. Knapp	Frontenac	clay loam	wheat	1891	20.0	19.0	20.0	21.0	19.0	16 0
John Kelly	Dufferin	"	alsike	...	9.5	10.0	8.0	9.0	9.0	9.0

Average results of 121 experiments :

Varieties	Yield of straw per acre.		Yield of grain per acre.	
	121 tests. 1894.	Experimental Farm tests. 2 years.	121 tests. 1894.	Experimental Farm tests. 2 years.
	tons.	tons.	bush.	bush.
Siberian	1.7	2.8	48.7	79.7
Poland White	1.7	2.6	48.1	70.4
Joanette	1.6	2.6	47.7	82.5
Bavarian	1.7	2.8	47.7	67.8
Lincoln	1.7	2.2	46.9	63.2
White Schonen	1.6	2.3	45.7	70.8

The Siberian variety was imported from Russia. and the Joanette and Poland wheat were imported from France in the spring of 1889. The seed of the Bavarian, the Lincoln and the White Schonen was obtained in Ontario.

Conclusions.

1. The Siberian, which stands at the head of the list in average yield of grain per acre of 121 experiments in 1894, also occupied first place in the average of 105 experiments in 1893 and 125 experiments in 1892.

2. The Joanette, which stands third in the list of 1894, occupied third place in the list of 1893, and also occupied third place in 1892.

3. The imported varieties have given a higher yield per acre than the Ontario varieties in the co-operative experiments over Ontario for three years in succession.

4. The Joanette is the shortest strawed variety of those tested in the co-operative experiments.

5. The Poland White was the freest from rust, and the White Schonen the most subj ct to rust of the six varieties tested over Ontario in 1894.

6 The average yield of grain per acre of the six varieties of oats tested at the Agricultural College during two years is about double the yield of the same varieties grown over Ontario in 121 different localities in 1894.

7. There is a great demand for oats in Ontario.

XII. TESTING FOUR VARIETIES OF PEAS.

Instructions.—Same as those given for spring wheat.

Average results of 63 experiments :

Varieties.	Yield per acre.			
	Straw.		Grain.	
	63 tests 1894.	Experimental Farm tests, 3 years.	63 tests 1894.	Experimental Farm tests, 3 years.
	tons.	tons.	bush.	bush.
Prussian Blue	1.08	1.7	27.9	36.0
Canadian Beauty	1.05	1.4	27.1	31.9
Fall White Marrowfat	1.09	1.7	26.8	35.6
Egyptian Mummy	1.11	1.6	26.3	36.8

The Prussian Blue and the Canadian Beauty were sown at the rate of $3\frac{1}{3}$ bushels per acre, and the Mummy and Tall White Marrowfat, at the rate of 4 bushels per acre. The grain was sown broadcast.

Individual results of 63 experiments :

Experimenter.	County.	Nature of soil.	Cropping of 1893.	How and when last manured.	Yield of grain on plot. Prussian Blue.	Canadian Beauty.	Tall White Marrow Fat.	Egyptian Mummy.
					lb.	lb.	lb	lb.
Jno. McKowen	Parry Sound	clay loam	oats	1892	20 0	16.0	15.5	14.5
Andrew Kennedy	Dundas	"	corn	1893, b.y.m.	15.0	13.0	17.0	13.0
David Rendall	Wellington	sandy loam	pasture	1890	8.3	9.0	10.5	7.5
George Baird, Sr	Huron	clay loam	oats	1893, b.y.m.	10.0	12.0	12.0	10.0
R. W. Hermon	Prince Edward	"			6.8	8.8	6.5	10.5
Jno Mosser	Wellington	"	mangels	1893, b.y.m.	6.0	6.5	3.0	6.0
H. B. Currie	Grey	"	fall wheat	1892, b.y.m.	15 0	11.0	12.0	8.0
Joel Brenton	Hastings	sandy loam	potatoes	1893, b.y.m.	8.5	7 0	8.5	10.0
Wm. Roth	Haldimand	stiff clay	hay, clover	1892	5.0	6.5	5.0	4.0
J. A. Hunter	Lambton	clay loam	oats	1892, b.y.m.	5.5	3.8	3.5	4.0
Jno. Sirr	Parry Sound	"	clover	never	10.5	12 5	13.5	14.0
Chas. Stroh	Waterloo	sandy loam	potatoes	1893, b.y m.	12.5	12.5	11.5	11.5
Jas. Haylow	Oxford	clay loam	corn	1893, b y.m.	4.0	3 0	4.5	3.5
P. Hutchins	Grenville				7.0	7 5	5.5	8.0
Chas. Kruegar	Grey	light loam	meadow	1891, b.y.m.	6.5	7.0	6.0	5.5
Jno. Grierson	Grey	clay loam	sod 3 years ago		14.0	16.0	13.0	15.0
J. H. Montgomery	Essex	"	corn	new ground	9.0	6.0	9 0	9.0
Jas. Wiggins	Grey	"	fall wheat	1894	6.5	7.0	8 0	7.0
Thos. Dryden	Bruce	loam	peas and corn	never	4.0	10.0	8.0	6.5
G. S. Hull	Middlesex	clay loam	first crop	never	15.5	14.0	12.0	13.C
J. W. Hetherington	Queens, N. B	gravel and clay	potatoes & oats	1893, b.y.m.	7.5	12.0	12.0	9.0
R. B. Fleming	Bruce	sandy loam	hay	never	13.0	10.0	12.0	12.0
Jno. McGugan	Middlesex	clay loam	corn		11.5	9.0	9.5	10.5
Ronald Dick	Norfolk	sandy	turnips	1893	7.0	6.0	1.3	2.3
Simon Miller	York	clay	hay		22.0	20.0	30.0	20.0
Francis Collison	Parry Sound	sandy loam	hay	never	11.1	11.6	11.4	11.5
Wm. Clarke	Muskoka	clay loam	oats	pasture in'92	8.5	8.5	6.8	8.0
Sam. Brown	Parry Sound	sandy loam	potatoes	1892, b.y.m.	8.0	5.0	7.0	6.0
Jos. Kinder	Renfrew	light loam	grass	1894, b.y m.	7.0	5.9	8.5	5 0
C. R. Stevenson	Elgin	good clay loam	oats	1890, b.y.m.	6.0	6.5	4.8	5.5
Jno. Steele	Lanark	sandy loam	potatoes	1892, b y.m.	14.0	11.0	12.0	11.0
Lewis Lamb	Bruce	str'ng cl'y loam	fall wheat	pastured	5.5	6.5	10.3	5.0
Chas. Venn	Algoma	heavy clay	oats	never	41.0	38.5	40 0	37.0
Jno. Closson	Kent	s'ndy clay loam	potatoes	1893	8.5	14.0	9.0	10.0
O. A. Lawrence	Halton	stiff clay	new ground	never	6.0	6 3	6.1	6.5
J. F. Wilson	Oxford	clay loam	turnips	1893, b.y.m.	8.0	10.0	9.0	9.0
Robt. Templeman	Lanark	clay	oats	1892	25.0	23.0	23.0	12.0
Herbert Elford	Huron	sandy loam	clover & tim'y	never	6.3	5.3	6.0	6.5
Wm. Rayner	Halton	clay loam	peas	1891, b.y.m.	3.5	4 0	3.5	3.0
Jno. Henry	Middlesex	"	carrots	1892, b.y.m.	33.5	25.0	24.0	30.0
Jno. Shiell	Huron	"	oats	1894	12 0	12.0	14.0	11.0
F. McDonald	Bruce	"	wheat	3 y'rs in f'l'ow	9.0	9.5	10.0	8.0
H. E. Hind	Haldimand	"	spring wheat	never	6 5	5.0	6 0	6.0
D. Hartley	Halton				3.5	5.0	4.0	4.5
Jno. Wilson	Muskoka	sandy loam	potatoes	1893, b.y.m.	14 0	10.0	9.0	15.0
Frank Small	Oxford	clay	pasture	never	11.5	10 0	9.0	8.5
Wm. Newson	Dufferin	clay loam	old sod	never	6 0	6 0	5.8	5.5
D. G. Grey	Middlesex	warm clay loam	clover	1892, b.y.m.	6.0	4.5	4.5	4.5
Andrew Quinn	Perth	clay loam	pasture	none for 5 yrs	6.0	12.0	9.0	8.0
M. Frazer	Perth	sandy loam			3.5	4 0	4.0	8.5
Jas. F. Knapp	Frontenac	clay	peas and oats	1890	14.0	10.0	8.5	8.0
V. E. Gawley	Bruce	rich clay	pasture	1889	12 0	9.0	15.0	13.0
Jno. E. Rowland	Perth		pasture		16.5	13.0	14.0	18.5
J. C. Nichol	Middlesex				9.5	7.0	7.3	6.5
Henry Johnson	Perth	clay loam	mangels	1893	8.0	10.0	9.0	8.5
Wm. Wood	Simcoe	loam	clover sod	1894, b.y.m.	15.0	16 0	14.0	19.0
W. J. Standen	Simcoe				8.0	9.5	8.5	7.5
Wm. Fitzgerald	Bruce	black clay	pasture	1891, b.y.m.	7.0	13	5.0	11.5
Peter E. Miller	Welland	loam	oats	1893	5.0	5.5	4.0	4.5
Thos. J. Fair	Hastings	clay loam	Indian corn	never	9.0	9.5	7.5	9.3
Fred. Foyston	Simcoe	"	fall wheat	1892	13.8	12 6	14.3	16.4
Francis Morley	Huron	str'g clay loam	fall wheat	1894	10	9 5	10.0	9.5
Wm. F. Haines	Parry Sound	heavy clay	roots		11.3	11 0	10.0	9.8

Conclusions.

1. The Prussian Blue variety of peas gave the largest average yield of grain per acre in the average of 63 co-operative experiments in 1894, and also in the average of 73 co-operative experiments in 1893.

2. In the average of 63 experiments with peas in 1894, the yield per acre of grain varied only 1.3 bushel per acre between the best and the poorest of the four varieties tested.

3. There is a great demand in Ontario for good varieties of peas, the applications being only second in number to those for oats.

XIII. TESTING SIX VARIETIES OF POTATOES.

(1) Prepare for planting *all* the potatoes received upon *uniform* plots made to an *exact size.*
(2) First count the potatoes, and then cut them in such a way that there will be exactly 66 pieces of each variety.
(3) One row 66 feet (4 rods) long is required for each kind. If the rows are placed side by side a distance of 30 inches should be allowed between the rows.
(4) Drop the pieces 1 foot apart in the row, and aim to have the potatoes placed 4 inches below the surface of the ground.
(5) Each variety should be marked with a good substantial label made out of wood.
(6) Flat cultivation thoroughly done is recommended.
(7) When harvesting the crop, watch carefully the requirements of the blank form below, and be very particular that all weighings are accurately made and carefully recorded.

Average results of 38 experiments:

Varieties.	Yield per acre. 38 tests, 1894.	Yield per acre. Experimental Farm tests, two years.	Average number of days to mature.	Table quality, 100-best.
	bush.	bush.		
Empire State	303.1	291.8	122	91
Pearl of Savoy	271.3	295.5	127	87
Burpee's Extra Early	264.8	231.3	102	100
Summit	253.5	247.3	117	82
White Star	247.9	264.7	116	73
Rural New Yorker No. 2	231.5	228.2	127	75

Previous to the year 1894 the work of the Horticultural Committee was devoted to the testing of varieties of potatoes. As the Committee on Agricultural Experiments was in a much better position to take charge of this work, and as it was the desire of the director of the horticultural experiments to carry on tests with varieties of small fruits, the experiments with potatoes were transferred from the Horticultural Committee to the Committee on Agricultural Experiments.

Conclusions.

1. The Empire State and the Pearl of Savoy gave the largest average yield per acre in 38 co-operative experiments in 1894 and in two years' trials at the Agricultural College.

2. The Burpee's Extra Early is the earliest, and the Pearl of Savoy and the Rural New Yorker No. 2 are the latest to reach maturity of the six varieties tested over Ontario in 1894.

3. The average table quality of the varieties tested in the autumn of 1894, as given by the experimenters is as follows, commencing with the best : (1) Burpee's Extra Early, (2) Empire State, (3) Pearl of Savoy, (4) Summit, (5) Rural New Yorker No. 2, (6) White Star.

4. The percentage of the crop of each variety which was marketable was as follows : Rural New Yorker, No. 2, 88.2 ; Empire State, 87.5 ; Pearl of Savoy, 86.2 ; White Star, 85.9 ; Burpee's Extra Early, 81, and Summit, 78.9.

5. The average weight of 30 best developed potatoes of each variety was as follows : Empire State, 13.5 lb.; Pearl of Savoy, 13 lb.; Rural New Yorker No. 2, 12.3 lb.; Burpee's Extra Early, 10.7 lb.; White Star, 10.7 lb., and Summit, 10.3 lb.

Individual results of 38 experiments :

Experimenter.	County.	Nature of soil.	Cropping of 1893.	How and when last manured.	Yield of potatoes per plot.					
					Empire State.	Pearl of Savoy.	Burpee's Extra Early.	Summit.	White Star.	Rural New Yorker No. 2.
					lb.	lb.	lb.	lb.	lb.	lb.
B. Johnson	Pr. Edward	clay loam	garden		60	54	53	38	34	30
W. S. Morrison	Haliburton	sandy	hay		58	45	56	50	42	45
Jas. Pegg	Grey	sandy loam	carrots	1893	63	49	55	63	54	56
M. Clipsham	Muskoka	clay loam	potatoes	1893	66	59	51	57	47	46
T. G. Raynor	Pr. Edward	sandy loam	potatoes	1893, b.y.m.	107	109	68	90	82	42
John Williams	Elgin	clay loam	virgin soil	none	51	17	23	41	41	42
John Burns	Perth	light loam	clover sod	1893	48	42	53	40	47	37
W. H. Metcalfe	Brant	sandy loam	turnips		53	55	40	45	38	47
T. C. Wheatley	Lambton	swamp muck	potatoes		91	61	88	88	59	73
J. F. Dix	Victoria	clay loam	fall wheat	1894	80	43	45	49	54	35
W. A. McGeachy	Kent	sandy loam	wheat	1894, b.y.m.	61	35	46	44	35	33
F. B. Hutt	Welland	sandy loam	onions	1893, b.y.m.	62	60	61	51	53	46
Alex. S. Weir	Muskoka	sandy loam	wheat	1894	75	90	100	70	110	80
Wm. Goodger	Oxford	gravel loam	turnips		41	34	29	35	27	30
C. A. Cass	Prescott	slaty loam	potatoes	1893	95	70	80	84	62	50
R. A. Richards	Lanark	sandy loam	oats		72	92	74	74	81	78
Geo. A. Carlaw	Northum'land.	light clay loam	peas and oats	1893, b.y.m.	71	66	64	62	42	38
S. W. Christie	Glengarry	gravelly loam	oats	1893, b.y.m.	66	37	53	40	65	50
T. L. Dunkin	Oxford	clay loam	new ground	new ground.	60	68	38	48	43	46
C. H. B. Angell	Wellington	sandy loam	vegetables		44	30	27	48	20	38
John Watson	Ontario	loam	hay	1893, b.y.m.	120	83	75	102	86	74
John Spear	Hastings	good sandy loam	potatoes		133	134	148	118	122	135
Thos. Dryden	Bruce	clay loam	potatoes		50	26	35	36	22	34
Donald McLaren.	Renfrew	sandy loam	peas	1893, b.y.m.	82	129	69	63	65	59
Donald McLaren.	Lanark	sandy loam	turnips		65	56	73	70	72	47
J. V. Lazonby	Simcoe	clay loam.			62	60	60	59	64	61
H. J. Marsh	Middlesex	clay loam.	potatoes, roots and corn		64	42	43	47	48	41
Wm. Ramage	Russell	light loam			63	72	80	57	62	47
Josiah Burton	Elgin	clay loam	sod		104	99	70	68	95	96
H. L. Beckett	Wentworth	clay loam	oats	1894, b.y.m.	41	42	23	26	29	26
T. A. Walker	Wentworth	sandy loam			84	75	53	72	81	102
John Havercroft.	Simcoe	sandy loam	timothy sod		41	37	55	36	31	24
James Miller	Renfrew	black loam	wheat	1893	67	73	82	62	68	44
S. H. Rittenhouse	Lincoln	sandy loam	corn	1893	51	46	45	32	41	25
Anson Groh	Waterloo	sandy loam	wheat		29	29	26	23	29	32
Roger Dunn	Middlesex	clay loam	carrots		50	50	75	59	45	49
A. C. McArthur	Glengarry	black ground.	oats		126	98	132	95	106	73
Peter Anderson	Bruce	sandy loam	turnips	1894	60	64	36	46	38	48

XIV. 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.

(5) In harvesting the plots, watch carefully the requirements of the blank form on this page.

Individual results of 81 experiments, received before August 20th, 1894 :

Experimenter.	County.	Nature of soil.	Previous cropping.	Yield of grain per plot.				
				Dawson's Golden Chaff.	Early Red Clawson.	American Bronze.	Golden Drop.	Bulgarian.
				lb.	lb.	lb.	lb.	lb.
Jno. Hilbert	Northumberland	clay	peas	10.0	8.0	8.0	8.0	9.0
J. Watson	Norfolk	loam	clover	12 5	12.5	11.0	11 5	13.0
David Greig	Brant	clay loam	oats	16 8	15.8	16.5	15.5	17.0
Jas. J. Howston	Kent	clay loam		12.0	12.0	10.0	8.0	6.0
Hopper Ward	Middlesex	clay loam	potatoes	3.8	2 0	1.5	2.0	2 5
L. V. Burnham	Lambton	sandy loam	corn	13.3	12.0	12.0	12.5	14.0
Robert Riddell	York	light loam	clover & peas	16 0	14 0	14.0	16.0	13.0
Jno. Barron	Norfolk	clay	loam	13.0	11.3	8.1	10.6	10.0
Nathaniel Dunbar	Bruce	loam	peas	15.0	14 0	10.5	13.0	13.5
Roderick Grey	Huron	clay loam		19.5	15.3	15.3	16.3	14.5
Jno. F. McCracken	Huron			20.5	23.5	17.5	19.0	14.0
Wm. Bell	Bruce	clay loam	barley	12.0	5.0	8.0	10.0	6.0
Jas. W. McLean	Lambton	light clay		7 5	9.0	10.5	11.0	8.0
Allan H. Cochrane	Huron	sandy loam	wheat	8.5	9.5	10.0	9 0	8 0
Frederick Fach	Norfolk	sandy	peas	9.0	8.0	10.0	8.3	6.0
Wm. Vorghi	Kent	clay	oats	15.5	12 0	15.0	16.0	14.0
Robt. Richardson	Lambton	clay loam	potatoes	19.0	14.0	12.0	15.0	11 0
Anson Beamer	Brant	sandy loam	hay	12.0	10.0	12.0	10.0	8.0
R. D. McCormick	Essex	heavy loam	potatoes	16.0	14.0	11 0	9.0	10 0
Jas. B. Byran	Middlesex	clay	peas	26.0	20.0	32.0	19.0	18.0
Chas. E. Henry	Lambton	clay	clover	12.5	13.5	14 0	14 0	13 0
Daniel Wood	Middlesex	clay loam	potatoes	11.5	13.0	10.0	10.0	11.0
Angus McLachlan	Lambton	gravelly loam	vegetables	12.3	10.0	9.0	9.0	8.0
Jno. Watson	Ontario	loam	potatoes	9 0	8.0	6.0	10.5	7.5
Jno. Burke	Norfolk			9.6	7 5	8.1	6.9	7.0
Andrew W. Baird	Lanark	sandy loam	clover sod	10 3	8 5	7.0	6.0	10.5
Michael Regan	Middlesex	light gravel	potatoes	15.0	14.0	13.0	14 0	16.0
A. G. McIntosh	Bruce	clay loam	peas	12.0	16.0	12.5	16 0	7.0
Jas. D. Marsh	Norfolk	sandy loam	turnips	14.0	12.0	13 0	11.0	11.0
George Jackson	Huron	loam	potatoes	5.0	6.0	5.0	5.5	4 5
J. A. James	Middlesex	sandy loam	oats	20.0	25.0	26.0	22.0	17.0
A. Wilcox	Kent	clay and sandy loam	beans	17.5	9.0	10.0	14.0	13.0
Sam McKinney	Simcoe	sandy loam		25.5	21.0	18.0	21.0	26.0
Albert Page	Wentworth	dark loam	hay	14 0	13 0	11.0	11.0	9.0
M. Drummond	Middlesex	clay loam	oats	6.5	7.0	12.0	8.0	13.5
Herbert Ingleheart	Halton	black clay	oats	12.5	11.5	13.0	13.0	10.0
					Jones' Wntr. Fyfe.	Early Gen'e. Giant	Surprise.	Early White Leadr
J. W. Fleming	Kent	clay loam	roots	33 0	36.0	28.0	30.0	20.0
David Smith	Peel	sandy loam	alsike	11.0	15.0	13.0	16.0	15.0
Geo. W. Beckett	Welland	clay loam	potatoes	6.4	12.0	9.3	7.8	8.5
Geo. McKay	Bruce	heavy loam	fall wheat	18.0	15.0	13.0	13.0	16 0
T. J. M. Skelly	Simcoe	sandy loam		11.0	4.0	8.5	5.0	5.5
Fred. Foyston	Simcoe	sandy loam		15.1	17.1	14.6	14.7	10.8
Joseph Ingles	Lambton	clay loam		12.0	12.0	11.0	9.5	11.0

Individual results of 81 experiments, received before August 20th, 1894.—*Concluded.*

Experimenter.	County.	Nature of soil.	Previous cropping.	Yield of grain per plot.				
				Dawson's Golden Chaff.	Jones' Winter Fyfe.	Early Genesee Giant.	Surprise.	Early White Leader.
				lb.	lb.	lb.	lb.	lb.
Geo. Doe	Elgin	clay loam	oats	8.0	8.0	10.0	8.5	8.5
Chris. J. Howes	Oxford	clay	oats	10 5	10.0	12.5	7.0	9.5
Jno. M. Armstrong	Bothwell			8.0	9.0	6.6	6.0	6.3
I. L. Chadwick	Norfolk	sand loam		10.5	11.5	12.0	11.0	10.5
D. C. McBain	Elgin	clay loam	corn	21.0	14.0	15.0	14.0	17.0
Samuel Doupe	Bruce	clay loam	peas	15.0	7.5	9.5	14.0	8.3
P. McNaughton	Middlesex			6.0	13.5	12.5	11.0	8.5
Robt. G. Graham	Brant	clay loam		5.5	4.5	6.8	4.8	3.0
James Dowswell	Norfolk	sandy loam	peas	4.1	4.0	4.4	4.0	3.5
Jno. Lawson	Huron	clay	peas	10.0	10.0	9.0	9.0	9.0
Thos. Scissons	Carleton	clay	oats	12.0	5.0	13 0	7.0	9.0
Wm. Hill	Norfolk	sandy loam		12.5	9.5	7.0	11.0	6.5
S. R. Wallace	Oxford	clay loam		14.5	9.8	12.0	15.0	13.3
Peter E. Miller	Welland	clay loam		13.0	7.0	10.0	9.0	12.5
Jonathan Austin, Jr.	Norfolk	sandy loam	clover	10.0	6.0	7.0	5.0	5.0
D. M. Anderson	York	sandy	potatoes	13.0	13 0	13.0	14.0	10.0
Jas. W. Hugill	Victoria	clay loam	peas	4.0	6.5	5.5	4.0	5.5
Leonard Eaton	Leeds	sandy loam	potatoes	18.0	13.0	10.0	15.0	12.0
Geo. N. Harris	Wentworth	sand		15 0	17.0	14.0	12.5	16.0
Samuel Christie	Bruce	sandy	peas	21.0	21.5	20.5	20.0	19.5
Daniel Quinlan	Simcoe	clay		8 5	7.8	8.0	16.0	8 0
Jas. Hooper	Huron	sandy loam		8 0	7.5	7.0	6 0	8.0
J. W. Stewart	Kent	sandy loam	potatoes	8.8	8 8	11.0	9.8	7.0
Hugh Lamont	Huron	sandy loam	peas	10.0	10.0	9.0	9.5	10 5
Isaac Laurence	Huron	clay		12.5	8.5	13.3	9.0	11.8
Duncan McVannell	Perth	clay loam	peas	16.0	13.0	12.0	14.0	10.0
David Yule	Northumberland	clay loam	corn	16.0	12.0	12.0	9.0	14.0
Jas. Black	Wellington	sandy loam		12.0	13.0	11.0	12.0	9.0
Jos. E. Lumley	Simcoe	heavy clay		21.8	16.8	15.2	16.4	15.4
Jos. McMahan	Lambton	sandy loam	potatoes	22.0	16.0	18.3	12.8	15.0
Sam. Lee	Wentworth	clay loam	potatoes	21.0	20.0	20.5	21.3	19.0
Wm. Kains	Middlesex	gravelly loam		8.3	4.8	8.5	7.8	5.3
Jno. S. Gesner, Jr.	Kent	clay loam	beans & corn	19.6	21.0	17.0	17.0	14.3
W. H. Wensley	Grey	clay	wheat	10.8	14.5	4.0	10 5	14.0
A. S. Hodgins	Stormont	sandy loam	potatoes	6.0	13.0	12.0	15.0	8.0
Arthur Pearce	Brant	clay loam	oats	14 0	10.0	10 0	11.0	9.8
T. H. Medcraft	Elgin	clay loam	barley	19.0	17.0	13.5	9.5	12.5
W. J. Standen	Simcoe	sandy loam	potatoes	17.0	11.0	13.3	15.0	11.5

In the autumn of 1893, nine valuable varieties of winter wheat were selected from seventy kinds tested at the Experimental Farm. These were divided into two sets, with five varieties in each set, the Dawson's Golden Chaff being used in every instance for the sake of comparison. Each applicant chose the set he desired, and the five varieties were then sent to his address. Each plot was one one hundred-and-sixtieth of an acre in size, and the seed was sown at the rate of one and one-third bushels per acre. One hundred and fifty-seven experimenters with winter wheat have already been heard from this season. Of this number, eighty-one favored us with satisfactory reports of carefully conducted experiments, sixty-one furnished partial reports, and fifteen wrote of failure or unreliable results. The eighty-one satisfactory reports came from twenty-six counties, thirteen of which were situated east and thirteen west of the city of Guelph. The nine varieties were grown upon the experimental plots at the Farm in exact accord with the instructions sent out over Ontario. As the Dawson's Golden Chaff was sent to every experimenter, it is possible to obtain a very reliable comparison of all the kinds distributed. The following table gives the average amount of straw and of grain per acre, of the varieties grown on eighty-one Ontario farms :

Name of variety.	Straw per acre (tons.)	Grain per acre (bush. 60 lb.)
Dawson's Golden Chaff	1.84	35 7
Jones' Winter Fife	2.02	32.5
Early Genesee Giant	1.88	31.7
Early Red Clawson	1.66	31 5
Surprise	1.73	31.4
American Bronze	1.83	31.2
Golden Drop	1.90	31.1
Early White Leader	1.80	29.2
Bulgarian	1.93	28.8

As the reports of the partial and the unreliable experiments have been discarded, and only the satisfactory ones used for the above table, this summary should be of great value and one well worthy the careful attention of the farmers of Ontario. The conclusions drawn and the remarks made by many of the experimenters indicate much thought, accuracy and good judgment.

Conclusions.

1. The Lawson's Golden Chaff gave the largest yield of grain per acre among the nine varieties tested over Ontario in 1894, as well as among the eleven varieties tested in 1893.

2. The Dawson's Golden Chaff was decidedly the most popular variety with the experimenters in both 1894 and 1893.

3. The American Bronze, Dawson's Golden Chaff and Early Genesee Giant possessed the strongest and the Bulgarian the weakest straw.

4. The Dawson's Golden Chaff and Surprise were the least and the Early Genesee Giant and American Bronze were the most affected by rust.

5. The Dawson's Golden Chaff and Early Red Clawson were the first to mature.

6. The Dawson's Golden Chaff and Early Red Clawson produced the largest quantity of grain per hundred pounds of straw.

7. The counties of Norfolk, Middlesex, Huron, Lambton, Bruce, Simcoe and Kent furnished fifty out of the eighty-one best reports received.

8. The average yield of the nine varieties of winter wheat tested over Ontario was 31.5 bushels per acre, and the average of the same varieties grown on similar sized plots at the Experimental Farm was 39.5 bushels per acre.

9. The general behavior of the varieties tested over Ontario was quite similar to that of the same varieties grown at the Experimental Farm.

10. Among the 156 experimenters who reported the results of their tests with winter wheat, only five speak of wishing to discontinue the co-operative experimental work, and much interest is manifested throughout.

For more detailed particulars regarding these nine varieties, as well as those of seventy-one others, which have been tested at the Experimental Farm, the reader is referred to the bulletin on Winter Wheat, which is now being printed by the Department of Agriculture, Toronto.

Distribution of Seeds.

The Experimental Union has furnished sufficient money for the distribution of two thousand five hundred packages of winter wheat over Ontario this year. These will supply five 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,
Early Red Clawson,	Early Genesee Giant,
Jones' Winter Fife,	Early White Leader,
Surprise,	Early Ripe
American Bronze.	Pride of Genesee.

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.

C. A. Zavitz,
Director.

Ontario Agricultural College.

The address was made very interesting by having the summary results upon charts, which were fastened upon the wall directly in front of the meeting. A great many questions were asked Mr. Zavitz during the two hours in which he was presenting this report. The answers to the most of them, however, are embodied in the foregoing report.

STRAWBERRY CULTURE.

By Mr. T. B. Terry, Hudson, Ohio, U. S.

I always prefer to speak of a fruit garden as a whole. I am not growing berries on a large scale; we have never grown more than half an acre of strawberries. What we have done is to try and grow all we can possibly make use of for our own use, and to try and encourage farmers to do the same. One word on the fruit garden as a whole. We have about half an acre devoted to small fruits for our own use, where we grow raspberries and blackberries and currants, and we have been trying to arrange so as to grow these with the least possible expenditure and labor. We are always busy in the summer, but still we want the berries and want the best ones. For six years now we have not cultivated the ground at all, not been in there with a horse, but simply mulch the surface all over with straw nearly a foot deep; put it on early in the fall before the snow, and by spring it is pretty well gone, and we put on more in the spring. We have been doing that for six years. We get abundance of berries, and in a dry time we get almost as perfect berries as we would in a wet season. We have, one year with another, about twenty-five bushels of berries on this fifty-four rods of land. Of course, we have different varieties coming along—early red ones and late red ones, and early blackcaps and medium and late blackcaps—and the same with the blackberries and currants; so that, taken in connection with the strawberry patch, which is right close by, there is not a single day for about eleven weeks that we cannot pick half a bushel of some kind of berries out of that fruit garden.

We think there is a great deal of luxury out of a little land in that way. I have estimated some years that the actual labor put on these raspberries, blackberries and currants that I have spoken of would not exceed six dollars a year at the price we pay for hired labor. We simply pinch all the tops off the canes; we do not bunch them or tie them up at all, and then we cut out the old canes any time when we have leisure in the fall and burn them, and the next spring trim them back into a nice head shape. We are not very particular about it, cutting them, perhaps, two feet wide, the blackberries about four feet high, and the raspberries, of course, lower. I can cut them in less than a day with a pair of grape shears. Putting on this mulch and hoeing off any suckers that may come up means only two or three hours each time, and that labor does not actually cost more than six dollars a year, while there are thirty or thirty-five bushels of berries of all kinds. There is not one farmer in ten thousand has any such thing, and still at only the expense of about six dollars a year. I have been trying to encourage farmers to put out a fruit garden and take care of it. I would not like to encourage them unless they would go at it and make a success of it. We have had too many fruit gardens growing up to weeds, and there is no money in that at all.

The strawberry patch we manage differently, of course. For our own use we have set out a new bed each spring for some years back—about sixteen rods—a strip two rods by eight. Now, I would take three times this amount of land, and rotate the berries the same as we do our other crops. After you have picked the bearing bed, plow it and sow clover, and then by plowing that under you get ready to set out another bed.

A Member: What time do you sow that clover?

Mr. Terry: Right after we get the berries picked in July; I have never had any trouble unless it was an exceedingly dry time. Just harrow and roll it until you get it as fine and settled as it is possible to make it; then sow the clover seed, and if it is at all moist it will come up and grow like anything. I have never failed to get a stand of clover that would be as good as the clover sown on our wheat in the spring. We set these plants in rows four feet apart, and two feet apart in the row, setting out a new bed each spring and then plowing the old one under after picking. In this way you can have the best plant in the world right on your own ground. Old strawberry plants should not be set out; you know they are not the best. We ought to have plants grown from plants that have produced no fruit and the longer you keep that up the better. From generation to generation it should be that way, and we can do that where we set out a new bed each spring. I would rather take care of a new bed than clean out an old one; and you get the best berries in the world the first year. Of course it is the second year after they are set out. For about six or eight weeks after setting out in the early spring, as soon as the ground is dry enough to work, we cultivate these strawberries just the same as we would potatoes or corn. We do not hoe potatoes and corn, but we have to do so with strawberries, because the weeder we use in potatoes would catch the strawberries out. For six or eight weeks we hoe them and keep all weeds down. Here is the secret of success. The constant stirring of clean soil is not an unpleasant job at all, and it is very cheaply done by keeping them cleaned about two months in this way. At the end of that time we let the runners grow. Do not allow any runners to grow or any blossoms to come out during these two months. Do not let them bear any and keep the runners cut off; keep them clean for the two months. In this way we get a strong, thrifty plant to start with to grow our runners on. Get the ground so free from weeds that there is very little trouble in taking care of the patch later. Of course I would not want to set out a strawberry patch where chick weed abounded. On ordinary clean land you can take care of them nicely. I would let the runners grow after about two months; of course they grow out to one side and they should be separated a little like the spoke of a waggon wheel running out from the hub, separate the runners so that they will cover all the ground. Now comes the trouble. These runners will grow too thickly; you get too many plants, and the result will be comparatively small berries not as large and as nice as we ought to have. When we had a half or quarter of an acre we practiced thinning them out. It is an extensive job, and we cannot attend to it all along through the season, so we let them grow and then thin them out till the plants stand from six to eight inches apart each way, and that will give each one sufficient feeding ground to do its best. If you take that precaution, and have good varieties and fertility enough in the soil to feed them well, you can grow berries as large as early peaches; and if you live near a large town you can get up a trade for these at a very high price. We did this with a half acre two or three years, just for the fun of it. We had some horticulturists who were growling about the berry business—no money in it, and we wanted to beat them just for the fun of it. We said if a man had something good he could sell it for a big price, so we grew fifty or one hundred bushels in this way. I suppose on a half acre we spent about twenty-five dollars' worth of time in thinning out these plants; many men would say, that was time all thrown away, fifty dollars on an acre. What was the result? We sold every berry we had at wholesale (and we did not have one-tenth enough) at four dollars a bushel, when you could buy all you wanted of common berries at $1.25 or $2.00. People would not look at common fruit at all. It was not the most wealthy people either; the laboring class in our town would not go past berries of this kind without taking some of them home. None of them were retailed for less than fifteen cents a quart and common berries sold at six cents. I simply told the grocer when I went with the first half-bushel to sell them at fifteen cents a quart and no less, and that if he did not sell them I would take them back. He said, "If I can do that I will give you twelve and one-half cents; but I do not think I can do it." But he did. This is the line on which I would work if I were going into berry growing on a large scale. The world is running over full of "ordinary" in any direction, I do not care what it is. The average farmer is in a bad way and always will be; you have got to get above the average. We have got a great many large towns and cities, and wealthy people living in them to whom a little money is of no importance. If you can get something that is extra nice they will buy it. Get the very best varieties. I would not care so much about yield per acre, because it is quality that will enable you to get the big price, and by this thinning out the plant will have a chance to do its best. In this way it will be an easy matter for me to get from six hundred to eight hundred dollars from an acre of berries, even from the little town where I live, containing only about 1,800 inhabitants. In a large city like Cleveland there is no limit hardly to the quantity that might be sold. Such berries are taken to the houses of wealthy people and sold for twenty-five cents a quart, while common berries are sold for six or eight cents.

We have always practiced mulching our berries, and I think it is very important. We keep them perfectly clean that way, and we know we are going to get a crop any way without any regard to the weather. We do not care whether it rains or not, for we are just as independent of the rain in the strawberry patch as in the potato field. I have been to berry conventions, where the growers were talking about irrigating, and how their crop would have been splendid if it had not been for the dry weather. We do not have any trouble in the dry weather at all in our berry patch. I do not see why the growers do not follow this practice of mulching thoroughly. We cover ours with ordinary wheat straw; of course this is free from weed seed and grass seed, because we do not allow any grass to get ripe on our farm. There are other mulches that would be better—marsh hay if we had that—but we use common wheat straw and spread it all over the patch, paths and plants, and just thickly enough so that we can see through. We put it on about the middle of November, but I do not think any harm is done if you put it on earlier than that. After the ground is frozen you can put it on as thick as you please—you cannot smother the plants then. In the spring when we have a rainy, misty day we rake off about half of this straw from over the plants and tread it down in the paths. Of course in the fall we hoe out these paths if they have not been kept clean with the cultivator, so that we will have twenty inches wide of path to walk in. We rake the straw off the berries and into the paths, making a double quantity there, and we tread it down; that is why we do it on a damp day, because it will pack down. I leave just as much over the plants as I think they will come up through safely and not be smothered or dwarfed. That amount of mulching will protect them on our farm (if there is plenty of plant food in the soil) against any drouth we have had. If it rains the berries will be clean, with no sand on them. All these things help when we are going to sell them at a fancy price. Then it helps very much to have lots of berries when other people do not have them. That is the way we make money in the potato field, by growing a large crop when other farmers fail. Of course this is a survival of the fittest, and it is hard on the other fellows; but I do not know any way that we can work up in the world but to fight, each man for himself, in this way. It is little more trouble to take care of the strawberries than the other fruits I spoke of. We make it a rule to go through the strawberry patch when we hitch up to cultivate after a shower. It does not take over thirty minutes. There are always three men: The hired man perhaps will go through the patch with the cultivator going twice through the row, and my son and myself will take our hoes and hoe the strip that is left and in a very few minutes the sixteen rods is nicely stirred all over. That is the first year; no cultivation the second year, the mulching takes the place of it. The cultivator we use for this purpose is a very light one with fourteen little teeth, they are so small they will not throw any dirt at all on the plants. Right next to the row we put two teeth of the harrow, end down, and the other are cultivator teeth, so we can run so close that you would look at it after we cultivated it and you would say we hoed it all.

Dr. Mills: Do you always go twice in a row?

Mr. Terry: Yes, it is necessary to go twice to do nice work, and you can do it very rapidly. I have a neighbor who follows rather a mixed system of farming and I have been trying to get him to grow strawberries for his own use. He has a number of children, and I know how well they like berries, for I have given them some lots of times. I have been trying for years to get that man to set out a strawberry patch. He came along two or three springs ago when I had just commenced working on our patch. He leaned over the fence and began talking to me. I thought there was a chance to do a little missionary work, and I said, "Why don't you set out a strawberry patch this spring? I will give you the plants if you will do it, and I will go over and help you set them out." "No," he said, "it is no use; I have got a great deal more to attend to now than I can possibly take care of on the farm." I kept right on hoeing as I was talking (it only takes a few moments to get over the patch), and that man leaned over the fence and talked to me till I got the whole patch hoed. That is about how it is with farmers who say they have not got time.

One of the most pleasant remembrances that I have had in the small fruit garden was this summer when a neighbor came along one day just as I was picking some "Shaffer" raspberries (they are very large and somewhat juicy.) He has a pair of twin daughters that he thinks about the nicest children in the world. He had one on each arm, and I had about two quarts of these berries in a can, and I stepped up before him and held them up and told the children to help themselves. They began very cautiously but soon got to work on them very rapidly. Well now, it would have done you good to see how they looked in a few minutes. I would give fifty dollars for a real nice painting of that picture. Still I cannot induce that man to set out any berries at all for these children.

I remember an old friend of mine in Chicago, a Chicago coal baron, worth many millions. He was in my Sunday School class when he was a little boy, and comes to see me once in a while. I hope he has made his millions honestly. He came to my place one time and we were standing under a tree on the lawn talking, and two of his children were with him and of course dressed in silks and satins. I suggested to them that they could go out into the fruit garden and help themselves. (They had probably never seen one before.) They soon found the way to their mouths, and as we were talking I noticed my friend look around that way, and a scowl came over his face. I looked around to see what he was scowling at. "You ought to have seen those children," he said, "they are making pigs of themselves." I said, "Jim, there is one thing certain, that with all your millions my children have some things that yours have not." He said, "You are right there; that is one of the advantages that only parties of your calling have. The farmer and his family ought to make the best of such things." Why, it is the longings of all wealthy men in cities to get out on to some land and to raise their fruits and vegetables and have something growing. There is a club in New York city composed of seventy-five millionaires—the Vanderbilts belong to it, Chauncey Depew and all these men belong too. I was invited to speak before that club last night. These men just long to get out on to some land and enjoy these things we farmers do not half appreciate.

A Member: Q. Don't you think in mulching strawberries heavily, that with a heavy fall of snow there would be a danger of smothering them?

Mr. Terry: No, sir. Mr. Crawford, of our country, says that after the ground is frozen hard he did not think two feet of manure would destroy them. I was on a patch in Black River Falls, Wisconsin, some years ago where they had actually drawn five hundred loads of manure on one acre of land in the winter when the ground was frozen solid. It did not seem to me they could possibly spread it on the land. I said. "Won't that destroy these berries?" "No," he said, "we are in the habit of doing it." The ground, of course, was frozen hard, but if you put it on when the ground is soft, then it will cause them to decay. We have practised lengthening the season in this way by putting a heavy mulch on part of our patch in the winter when the ground is frozen. If you leave a small portion of the patch without any mulch, and then mulch a third a little and a third heavier, we can extend the season about ten days. That is we can have strawberries about ten days longer and possibly more than that. The uncovered ones of course come on first, and those that have the heavier mulch are kept back about a week. The ground is kept frozen so that vegetation does not start.

Mr. PEARCE: What time do you set out your plants?

Mr. TERRY: Early in the spring; of course an expert may do it almost any time in the year.

Q. What variety do you grow?

Mr. TERRY: We have to have quite a number in order to get all the advantages that we want. One berry will be very nice to can and perhaps not as good for eating. Tart berries are better to can. The old Wilson was good. The Charles Downing is delicious to taste, but I would not want to raise them to sell at market rates. If I could sell them at fancy prices it would pay to grow them.

Q. Do you consider the Wilson the best general purpose berry.

Mr. TERRY: It was at one time, but I would be afraid to say so now. It has been running so long most growers are giving it up. We have the Stirling in place of that. It has very much the same flavor and habit of growth. It is the best berry we have got for family use.

Q. How do you plant them?

Mr. TERRY: We just plant a few for our own use. We plant with a trowel. It is handier, however, for a man to make holes with a spade and then follow with a trowel. If planting on a large scale I should mark out with a horse. The prettiest mark we ever made was with our potato planter.

Q. What width do you allow them to grow?

Mr. TERRY: For our own use about twenty-four inches, but I suppose twenty-eight would do.

Q. How do you confine them to that width?

Mr. TERRY: I cut them off in the fall.

Dr. MILLS: How do you do this thinning?

Mr. TERRY: We have done it with a sharp trowel. Simply taking out the weakest plants, and where there are too many strong ones, take them out. If we want to do our best we take the old plant out. It has exhausted itself producing runners and will not produce fruit. I would not do it myself for $200 an acre. It is quite a tedious job.

Q. Do I understand you to say that you set the plants out in the spring, and after they have been growing about two months allow them to run?

Mr. TERRY: Yes, we want to get the plant strong before we allow it to produce, and at the same time we get the land clean before we let the runners grow, and then we don't have much handwork after that. We do the thinning in the fall about the first of October, and the mulch is put on in the fall.

Q. Where do you take the plants from in the spring?

Mr. TERRY: Just commence at one end of the bed and take it clean as you go.

Q. What kind of soil gives the best results?

Mr. TERRY: It does not make any difference. We have berries that will do well on drifting sand or on the heaviest clay. I have seen berries that grow on sand in Wisconsin; I would not give one dollar an acre for the land, but they have to put on lots of manure. And I have seen them grow on clay that when it is dry you can nail a board down on it and it will stay there. Mr. Crawford has made a national reputation from growing strawberries on three acres of land, and has put three sons through college from that three acres of land. He has done it by high culture and by attending to every plant right up to the handle. For years he did not have a horse on the patch.

Q. What rotation would you advise for strawberries.

Mr. TERRY: Just clover. If I were doing a little market gardening I would put the land into market crops one year.

Q. Do you plow this clover down again?

Mr. TERRY: I would for the strawberries; it is the cheapest way of manuring. We do not want to take any manure from the farm for the strawberries. We have sold an even $300 worth of berries from a half acre that had no manure put on it.

Q. Is not there danger of the plant dying out on clover sod?

Mr. TERRY: Yes, if a man did not do his part; but if he will roll and harrow the land until it is settled I do not care whether it rains at all or not. It is simply making the ground firm enough. If it is fine and firm it will stand the drouth.

ADDRESS BY HON. JOHN DRYDEN.

Mr. CHAIRMAN AND GENTLEMEN,—I have been greatly interested in the discussions that have taken place on this occasion. I have always believed that the work you have in hand in connection with the Experimental Union is very important. I believe it is important because there are dollars and cents in it for the farmers of the country. What are you seeking to do? Seeking to find out what the truth is in reference to these various varieties of grain, etc., when grown under different conditions and sown at different times. Now, there is a great deal of labor in finding out exactly what the results are. These young men who have gone through the college know that Prof. Shuttleworth will take you into the laboratory and under his instructions you will be able to find out for yourself what are the component parts of certain substances submitted, and you will also learn how to combine certain elements so as to manufacture certain articles for yourself. Well defined rules govern your action. The truth has been accurately ascertained. But in order to find out the truth in grain growing we must depend entirely on actual experiments and the difficulty is that after you have found out the truth in one case you are no nearer in another; after Mr. Zavitz has discovered the truth at Guelph and after Mr. Terry has found out what the truth is in Ohio, then the true thing for them to do, as I discovered, unfortunately, is not always the true thing for me in my peculiar circumstances; with my peculiar soil, with the difference in climate in Ontario and Ohio, or, for some other reason, when I follow Mr. Terry's instructions implicitly I find I cannot reach exactly the same result. The fact is, we must all be experimenters and we should be helpers to each other in this regard.

Co operative work in this matter of experimental work is what we want. I would like to say that in agricultural pursuits there is no word I would like to impress on everybody present more than this word "co-operation." We heard a fine address from Mr. Terry last night on co-operation in marriage. I suppose you all agree with what he said and are prepared to carry out the platform he laid down. There is a great deal in it, but there is immensely more in connection with the work which the farmers of this province have in hand. I do not know anything that pains me more than to find farmers refusing to link themselves together for mutual help and benefit. There is no class of people who naturally stand aloof from one another more than the farmers. But this is a great mistake and prevents general progress. Take these experiments that are carried on in the different parts of the province. If I were a young man, and had the time, I would be one of your experimenters, and if I could get a half dozen others around me to do the same thing, how much easier it would be for all of us? I could suggest that one man take barley, another man fall wheat, another spring wheat, another potatoes, and so on. The result would be that I would receive the benefit of all these different experiments. What suits one does not suit others, but there are always a certain number of persons who are almost exactly similarly situated, therefore, they could utilize these experiments which are thus carried on. Do you think it means anything to me if I can succeed in finding out a variety of wheat and a variety of oats, or a variety of barley that would actually give me ten bushels an acre more than any other varieties? Will anybody in the country say that if we can by the work of this Experimental Union enable our farmers to secure such varieties as will accomplish this, there is no use in carrying on this work? It adds immensely to the wealth of the province, and therefore every man and woman in the country ought to be interested in the work of this Experimental Union.

Who ought to experiment for the Union? Certainly not an ignorant man such as our friend Mr. Terry has been describing. Certainly you must not have a superstitious man who won't plant his potatoes or sow his barley except when the moon is right. Nor should you have a man so full of prejudice that you cannot get any new light into his mind at all; a man who has learned long ago all there is to know about it. These are not the men who will make successful experimenters. You want an intelligent man; you want a man who has got some reasoning power; you want a man who is likely to take into consideration the various circumstances which surround the experiments.

There is in such matters great danger of jumping at conclusions. One of my neighbors, not very many years ago, was pointing out to me that his barley had been almost entirely destroyed by frost. The funny thing about it was that we had not had any frost since he had sown. The young men here know that barley is not a delicate plant, that it is not easily hurt by the frost. I have seen the ground frozen so that I could walk over it, when my own barley was just appearing through the ground, and I have seen the sun come out and take away the frost and the little tender shoots come up the same as ever. My neighbor said his barley was ruined by frost. Why did he say so? Because he saw the color was changed, it was turning yellow and some of it white. Most farmers have seen that. This man jumped at a conclusion without taking into consideration all the circumstances. If he had thought a little, he might have known we had not frost enough to do his barley any injury. If he had gone to my field he would have found barley sown two weeks before his, that did not show that indication at all. Whatever the cause, it was not frost. You need in these experiments to take into consideration all these circumstances, and I cannot impress upon you too strongly just what I said this morning about these little details. All these things must be thought of when you want to find out correctly what are the results.

Who of all the farmars in the country would be more likely to carry on successful experiments than the students who have gone through this college? Those who have gone back to their farms with all the knowledge of the experimental work here. Those are the persons, it seems to me, who ought to take an interest in it. I believe a good many of them are interested. Of course this Experimental Union started with the ex-students. But I am told by the officers of the Union there are some ex-students who do not give this work as much attention as they ought to.

If you are able, by carrying on these experiments, to produce a better quality of potatoes or to produce better strawberries, what is accomplished? You have not only benefited yourselves but you have benefited the man who lives in the city and who never sees your farm. You have brought comfort and blessing to his home. I venture to say by the work in connection with this college and the travelling dairy we have brought comfort to many a home, simply by giving people better butter to eat. It is an awful trying thing to have to submit to the torture of attempting to eat something which is not fit for human consumption. Therefore, when you produce a better article you are not only benefiting yourself by securing a better price but you are bringing comfort and blessing to those who are consumers of the article which you produce. Therefore, taking all these things into consideration, the work we have in hand, in connection with this Experimental Union, is important.

I am glad to see the work is growing; I am glad it commenced to grow rapidly about the time I began my work as Minister of Agriculture. I do not know why that should have been exactly, but I see it is the year I commenced that you began to spread out. I commenced in the latter part of 1890, and you began to spread out in 1891. The more ground you cover the more money you will require from the Legislature. I believe this Experimental Union is carried on quite as economically as any kindred association in Ontario. I believe the officers are trying to do their best in accomplishing the most good with the least money. I am seeking to stimulate all our associations; some of them have come now to think that I am generous and have the faculty of getting money out of the Legislature. I have had two or three hints from different associations that they would like to have a little more money this year. They said, "we have hard work to make both ends meet," and I said, "don't you think you can do better work when you are squeezing and tightening up a little? If I give you too much money you think you have plenty and you spend it in unimportant work. You had better try it again and you will make it go just as you did before."

I am sure this Union will in the future accomplish as much work for the good of the country as any of our associations. I am greatly interested in it. I shall be proud to declare its worth anywhere, and I tell you the truth, when I say, I would not have been here to-day were it not that I felt the importance of this meeting, and I desired by my presence and voice to give you all the encouragement I could. (Applause.) I can assure these young men that I did not come here because I had nothing else to do. I am busy every day, but it is very pleasing to know that one can labor in work such as that in which I am engaged, and do some good for the country. My politics all lie in that direction. There are one or two gentlemen from London here. I told the people in London that I considered good work was the best politics. I meant what I said. I believe this Union is doing good work and I would like all the young men to be interested in it. I hope when they return home they will connect themselves with this Union and send for some samples of seed for experimental purposes.

It is necessary for all to be interested in the work. If we ever see the day when the farmers of this country, recognizing a common interest, will take each other by the hand and recognize that they are brothers in every sense; that when they are helping another they are surely helping themselves, then we shall have better farmers, better institutions, better legislatures, and a great deal more success than we have now. It is towards that end we are working in connection with this Experimental Union, and I once more appeal to the young men here to use their influence to help all they can in carrying forward this very important work. (Applause.)

REPORT OF THE COMMITTEE ON HORTICULTURAL EXPERIMENTS.

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

The report of the Committee on Horticultural Experiments this year is not one of results attained, but of progress made. In the past the work of this committee has been principally in testing varieties of potatoes, and different methods of growing these. This year it was thought advisable to give over this work to the Committee on Agricultural Experiments, and to devote our attention to the testing of varieties of fruits.

A start was made in this direction last year, when two sets of experiments were outlined and the plants for twelve lots of each set sent out.

No. I experiment was a test of four varieties of strawberries: Haverland, Williams, Wilson and Bubach No. 5, under the hill and matted row systems of cultivation. Two dozen plants of each variety were sent to each experimenter.

No. II was a test of three varieties of raspberries: Cuthbert, Marlboro' and Golden Queen, under pruning at different heights, viz.: 1, 2, 3 and 4 feet. Eight plants of each variety were sent to each experimenter.

In response to enquiries sent out this year as to the results of these experiments only seven replies have been received, most of these reporting that owing to one cause or another the experiments had been a failure. Our most valuable conclusion arrived at from these experiments is that it is inadvisable to expect successful reports from experiments quite so complicated. In the future we will feel quite satisfied if we can get simply the reports of yields from different varieties all under the same treatment.

In accord with this conclusion the experiments drafted for this year were much simpler, all being variety tests as follows :

I. Testing four varieties of strawberries : Wilson, Bubach No. 5, Williams and Bedderwood—12 plants of each.

II. Testing four varieties of red and white raspberries : Marlboro', Cuthbert, Shaffer's Colossal and Golden Queen—6 plants of each.

III. Testing four varieties of black raspberries : Souhegan, Gregg, Palmer and Tyler—6 plants of each.

IV. Testing four varieties of currants : Fay's Prolific, Victoria, Raby Castle and White Grape—3 plants of each.

With but $50 for this work, only fifteen lots of plants for each experiment could be sent out, or in other words only sixty experimentors could be furnished with plants with which to experiment.

Two hundred circulars were sent out, inviting farmers and fruit growers to co-operate with us in carrying on these experiments. In response to these, 103 applications for plants were received—43 more than could be supplied. The plants were sent out from the nursery of E. D. Smith, of Winona A circular giving full instructions for planting and caring for the plants was prepared and sent to each experimentor. This circular also contained a blank form on which to report at the end of the season as to how many of the plants had lived and what growth they had made. No yield of fruit of course, could be expected from any of them this year.

In all 47 reports have been received as follows : 9 on strawberries, 13 on red and white raspberries, 14 on black raspberries and 11 on currants.

Some of them report partial failure on account of the lateness of planting and the extreme drought during summer. Sufficient reports of complete success have been received, however, to warrant us in looking for valuable results in a year or so. From the strawberries we may look for results next year. We are much pleased with the willingness which experimentors have shown to co-operate in this work, and after it has had a little time to develop, we expect to obtain valuable results and hope next year for a larger grant to enable us to extend the work.

HORTICULTURE IN CONNECTION WITH AGRICULTURE.

By Elmer Lick, Oshawa.

Without a thorough knowledge of the essentials to success in any occupation, favorable results from our labors cannot be expected. There is no occupation open to man but requires careful consideration before it is entered upon. On virgin soils this may not be as necessary as in this Ontario of ours. The time has passed when a good crop can be expected under unfavorable conditions. In fact, the past season has shown that unless we as agriculturists perform our operations in the best possible manner we may look for poor results. One of the essentials to success in horticulture, as in all pursuits of life, is the man. The horticulturist must have a liking for his business, must feel that the trees or plants he grows are living things, with needs and wants. He must study these needs and wants. He must also study how best to supply these needs and wants. A suitable soil is one of the necessities. A soil that is best suited for peaches will not be as satisfactory for apples, although under proper treatment both may be made to do fairly well. A suitable climate for the crop grown is also necessary. It would be useless to attempt to grow here at Guelph peaches, or even some varieties of apples, which would do well along the shore of Lake Ontario. A good market at no great distance from home for small fruits and other perishable fruits is essential to their profitable growth. For apples it is apparent that England is to be the market for most of our surplus. For this market, it is essential that only varieties having good shipping qualities with good size, color and form be sent. Nearly all varieties of fall apples should not be sent to that market. Poor and second-class stock of winter varieties are a great detriment to the reputation of our Canadian apples. Having briefly mentioned the above there yet remains two other essentials, with which we wish more particularly to deal. The first of these is the question of manure. This is a very important consideration in horticulture. Where can suitable manure be obtained? It is universally accepted that farmyard manure is the best fertilizing agent known for orchards. It is somewhat uncertain whether commercial fertilizers can be economically used for the production of apples. These will supply the chemical requirements, but the humus of the farmyard manure is of great benefit in loosening the soil and acting as a mulch and assisting in retaining moisture. If it can be shown that commercial fertilizers can be substituted for farmyard manure in the profitable growth of apples, then horticulture can be successfully managed separate from agriculture proper. The second question that requires attention is the work connected with it. There must be help sufficient to perform the various operations at the proper time; pruning in March, plowing or other cultivation in May and June, picking and marketing, in case of apples, in October. In May and June it may also be necessary to spray or use other means to overcome insect and fungous enemies. These must all be performed at the right time or loss is certain to follow.

Having said this much about horticulture, let us enquire what branches of agriculture will give the necessary time and manure without hampering the agricultural operations. Dairying, to my mind, is one of the best, if not the best branch of all. There is only one time of the year when dairying and horticulture will clash to any extent as to time and attention required by each, that being the month of October, when apples must be picked and also a month when cows need greatest care, as it usually is weather requiring stabling and feeding. However, an extra hand will overcome this difficulty. Dairying is one of the most profitable branches of farming, and when combined with hog-raising may be reasonably made to use up all rough grains grown on the farm, with a considerable quantity of purchased food in the shape of bran, oil cake, cotton-seed cake and other foods rich in manurial properties. I wish to be understood as strongly advocating this as the cheapest and most satisfactory method of procuring manure for our orchards, and that, too, without impoverishing the soil of our farms. There is, however, one provision necessary in order that the above statement may be correct, and that is, the acreage devoted to horticulture must not be too large a portion of the whole. My own idea on this is that not more than four acres of each hundred should be devoted to horticultural purposes. If this four acres be an apple orchard a dressing of eight to twelve loads per acre each year of farmyard manure may be reasonably expected to give profitable returns for the labor and manure used in the orchard. The feeding and fattening of cattle may be made to take the place of dairying, but unfortunately is not as profitable at the present time, although it may be in the near future. Grain growing and horticulture cannot be made to go together without one or the other being neglected. In dairying and horticulture the best care and treatment will pay, and anything less will not pay. Many of the branches of farming can be made to pay on a large scale where a company engages overseers and help. I do not expect that these two branches will ever come under large companies or syndicates. There is one insurmountable barrier, that of a personal interest, which is, to my way of thinking, more necessary than in any other occupation. For this reason I think that dairying and horticulture are safe branches for the farmer to engage in if other conditions are favorable.

In the neighborhood in which I reside there are several forceful illustrations of the profits to be derived from an apple orchard. In one instance south of us, a small orchard of about two acres has paid more than any 10 acres, of a very productive farm. This year this orchard produced 187 barrels of apples which were sold at $1.50 per barrel. This orchard has averaged nearly this for a term of years. Another orchard to the east, has done nearly as well, and would have given better results had there not been too many fall apples. One of our own orchards sometimes exceeds $200 per acre, and averages over $100 per acre. These are exceptionally good returns, but show that there are large returns under favorable conditions. On the other hand another person has 30 acres of orchard without any additional farm. He uses but little manure, cultivates fairly well, complains that he does not get apples, thinks his orchard is too thick, and notices the leaves ripen and fall early in October. It is needless to add that his returns are far from satisfactory. In conclusion I would like to impress this one idea: Do not undertake more work in horticulture than you have time and manure for. Remember that there is no crop that will pay better, but on the other hand their is no crop in which the risks are greater. A few days' rain at blossoming time, heavy winds in fall, or heavy crops in all portions of the world may cause very poor financial results.

Mr. KENNY: I find there is a great deal of uncertainty with regard to the returns of our orchards. I know numbers who had two and three hundred barrels of apples three years ago that this year did not have thirteen barrels in their orchards. Hail swept through and they had hardly an apple left. With regard to manure, I believe ashes are about the bes to put around our trees; not piled up agai st the trunk but scattered around the roots. Some one has said you might just as well feed a horse oats around his hind legs as to put ashes around the trunk of a tree.

The CHAIRMAN: Do you spray your apple trees?

Mr. LICK: We have about thirty acres of orchard, and this year we have had a lot of other work thrown on our hands, and I have never been able to get down to the spraying. There is another difficulty we have to face—a difficulty I have been trying to overcome. My father got it in his head that he could make five acres of orchard pay, and used to put near all the manure raised on that orchard. And that orchard certainly produced more apples than any other orchard during the last ten years in the Province of Ontario; but the other two hundred acres of land were not treated fairly. I have had the management for the last four years, and I am trying to manure the other land, and not altogether neglect the orchard.

A MEMBER: What varieties do you grow?

Mr. LICK: The most paying are the Baldwin, Greening, King, Pippin, Golden Russet and other varieties; we have a few Northern Spies and Rhode Island Greenings.

A MEMBER: Are you troubled with the wood being tender?

Mr. LICK: No; we are just east of Toronto on the shore of Lake Ontario.

Q. Did not you find the Baldwins subject to black heart?

Mr. LICK: A great many orchards in our locality are troubled in that way, but there seems to have been great care exercised in selecting our trees, and very few of them are troubled with black heart; the greatest trouble we have had was that ice storm a year ago which hurt many of our trees and destroyed many of our bearing ones. The Cranberry Pippin being a straight tree, it nearly destroyed the whole of them. They are nearly equal to the King as a selling apple in the English market.

Q. Have you tried wood ashes as a manure?

Mr. LICK: It is difficult to get them, everybody burns coal. We put a few wood ashes in the orchard—but not enough to give us a good result as to their value.

Q. Did you notice the Northern Spies rot this year?

Mr. LICK: I noticed that nearly all our apples rotted this year. What few apples we did have are being sold on the English market, and I am shaky about the result, for on handling them over we have found an apple that was apparently sound and if we squeezed it a little hard we found our finger went through and it was rotten in the centre.

A MEMBER: I thought one cause of this was the continued drouth and then wet and growing weather following, which gave a second growth and that growth has been too rapid and not as firm as it should be.

A MEMBER: Would you use wood ashes in place of barnyard manure, or in addition to it?

A MEMBER: I would use wood ashes altogether if I could get plenty. Spread within a few yards around the trees, especially the pears, and you will find it of great use.

Mr. MONTEITH: I think we need considerable nitrogen and phosphoric acid also in connection with the tree in order to give it that vigor that will carry blossoms through an unfavorable spell of weather. We plow our orchard in the latter part of May or early in June, sow buckwheat and harrow it early. If the buckwheat comes to anything we sometimes harvest it or allow the hens and turkeys to do so.

A Member: I think it is a great mistake having trees too thick. If I were planting an orchard I would have them forty feet apart; you cannot grow anything if they are too close together.

A Member: I do not want to grow anything except apples. If I can get an average of $100 per acre after paying all expenses, I am satisfied.

Q. Could you do that?

A. We have been doing it; of course we did not do it this year.

Mr. Hutt: I think all young orchards should be kept cultivated. Keep them cultivated till they come into bearing. I never would stop that cultivation as long as the trees give good results. I am not in favor of plowing in the orchard. The orchard should be kept cultivated from year to year without plowing, by cultivation like that and manuring. If after a time the trees begin to show a tendency to woody growth, then allow them to go a year or two in sod. You can sometimes check that woody growth as soon as the orchard has been a year or two in sod this way. It is also well to protect it by manuring. I think there is no manure better adapted for apple trees than wood ashes. They contain all the inorganic elements that go to make up a tree. It is the tree burnt down. Of course nitrogen is necessary, but we can get enough of that in the soil. That question of growing clover on the soil I am not quite certain of yet. I would not seed down with clover and plow it down again, but give good cultivation without plowing at all. The most important thing in apple growing has been neglected, and unless we follow up spraying there will be more orchards rooted out. The question of spraying is one that we must pay attention to. There is an apple rot they call "bitter rot," but if trees are properly sprayed with the Bordeaux mixture the fruit will not be so liable to this rot. The first spraying should be the copper sulphate solution, about one pound to fifty gallons of water. This should be applied before the leaves come out, and it will kill any spores of this fungi that may be on the branches of the trees. Then later on, as soon as the leaves come out, before the blossoms open, spray them with the Bordeaux mixture, and after the blossoms have formed give them another spraying; and this may be repeated once or twice after that at intervals of ten days or two weeks. Of course Paris green should be used with that for the codling moth.

POTATO CULTURE.

Mr. T. B. Terry, Hudson, Ohio.

I have spoken of growing the clover in spite of dry weather, and I think perhaps I will talk in this direction as regards potato growing. How can we get a crop in a so-called poor year? Any man can grow potatoes when you have a good season, but how are we going to get a good crop when the conditions are against us? That seems to me the most important point I can speak of. The whole subject is too large to go into in a single day. In the first place, as a foundation, in most cases more vegetable matter is needed in the soil. We have farmed our lands perhaps for a long time, and they are becoming hard and solid. The vegetable matter is largely used out of them, and you cannot get the best results in potato growing until you get that back. Old men in our locality have often told me how, when they were boys, they could plant potatoes around where I was, and in the fall kick them out by the bushel without having done any work upon them. They cannot do it now, for a man has to work hard to get a crop. Is it not wise for us to try to get this old position back? We are trying to do it largely by clover growing. We cut one crop for hay, and then turn the second under, and in that way we are gradually increasing the vegetable matter in our soil. This will help us in getting a crop in a dry year. The more vegetable matter you have in the soil the more water it will hold. Mucky soil will hold a larger quantity of water, simply because there is more vegetable matter in it. When we have this foundation we then want to pay attention to the tillage of the crop so as to save all moisture during the growing season. I might say that in our land with this clover mulch, through the fall and winter and spring, it very rarely lets any water run off on the service, and that obliges the land to soak it down, and enables us to store up water in a wet season. Then we have it there the next year to draw on.

There is hardly ever a season that water enough comes from the clouds to supply what moisture the crops need We have to depend on the water stored up in the sod as well, and we draw on that during the dry weather as we want it. If we let nature manage this she is very wasteful of this water; we must manage it ourselves and prevent loss. The very best way would be to mulch the surface, as I spoke of this morning, as we do in the small fruit gardens. But it is not practicable on a large field. The only practicable way there is to stir the surface two or three inches deep and form an earth mulch as we call it to check the evaporation of moisture. You know that water is constantly working up during the dry weather through the soil to the surface. If we let that water come right up to the surface it will be rapidly evaporated by the sun and wind, and if we stir the earth up the water keeps coming up to this stirred surface and is spread around among the roots of our crops. We might save hundreds of barrels of water on an acre of land by careful attention to this point. We cannot say, as our fathers used to, that we will cultivate once a week or once in ten days. No, we have got to cultivate just as soon as the land is dry enough to go on to, after each shower. No matter if we cultivate the day before and it rains that night, we must go on the next morning. Of course we do not always know that it will help us, because we may have plenty of rain in the future, but the only way is to act as if every shower we get is the last we are going to have that summer. Once in two or three years it will pay tremendously when we have a dry season. Do not think this is all theory, because I can assure you that it is a scientific fact. We have made thousands and thousands of dollars on our little farm by just paying attention to this one point, which has long been taught us by science. We have sold as high as twelve or fifteen hundred dollars' worth of potatoes in one year to farmers living right around us, beginning with our very next door neighbor. We have had men come to our door and take potatoes at 75 cents and $1 per bushel, and these men all planted some in the spring and didn't have any in the fall; and we had them to sell to them and made a profit on them that no trust in our country has dared to make. Why did we have them and these men not have them? Because we paid attention to these scientific points that have long been taught us—getting vegetable matter into the soil and then by careful attention seeing that there should not be any unnecessary waste of moisture. You young men of course know that it takes about 400 to 500 pounds of water to grow one pound dry weight of weeds. Is not there a practical lesson in that to us farmers? Many men would think they had a pretty clean potato field if there was not more than 300 or 400 pounds of weeds on the acre. Just figure up how many tons and tons of moisture these few weeds have taken out of that soil. In a wet year it does not make much difference, but in a dry year it is very great, there is not enough moisture for both weeds and plants. When we take these two points into consideration, the plant food used up and the water used up, it makes a great difference. If we want to grow a crop of potatoes in a dry year we do not want to let any weeds grow. The weeds should never see daylight in our farming operations in any of our crops—that is, hoed crops. Of course we do not sit up all night to get the last weed out of our crops, but practically I believe we could have carried on a wheelbarrow all the weeds you could get on ten acres of our potatoes last year. I have had visitors before now point to one and feel quite triumphant to think they had found a weed. Now, I am not at all afraid to make a statement, that I can grow a crop of potatoes—not of course a large crop, but say 150 bushels per acre of early potatoes, planted early—and carry them through on the spring moisture without a drop of rain from the time they are planted until they are done. I have come so near doing this that I actually know it can be done, simply by paying attention to these points I have spoken of, getting vegetable matter in the soil and then taking care all along the line of tillage. We have sold potatoes in a dry year for a price that would net us after paying the whole cost of production and 6 per cent. interest on the value of the land at $100 per acre—a price that would net us more than the price such land sold for in our locality. These are facts, and does it not pay to give our attention to these points? In fact, if I could have my choice I would have a so called poor year every year, for these are the years that farming pays best if followed up. You may, however, think that it would cost too much to till a crop so thoroughly, but really it does not cost any more than it used to cost an acre in the old way.

We have implements now that will do the work very rapidly. A man growing a few potatoes of course cannot afford machinery for doing this work, and hence I think in the future we must look for the most success where potatoes are grown as a special crop. Where a man grows enough of them to make it a business, he gives his whole attention almost to it. We use the Thomas Smith harrow. After the crop is planted until they come up, going over the ground probably three times on an average; 20 acres are done in ten hours without any trouble, and it keeps the ground perfectly clean from weeds. Fifteen or eighteen years ago we would let the weeds and potatoes grow together, and when they got up we would go through with the cultivator and tear up all we could and then go through with the hoe for the rest of them. How silly that was, for the weeds had used up the plant food and moisture out of the soil. Now they come up in perfectly clean land, and we use a lighter smoothing harrow after they are up, known as the weeder. There are several different kinds made. This is drawn by one horse, and takes two rows at a time; it stirs up the soil where the land is clean and reasonably free from stones and not heavy. You cannot get the best success of course growing potatoes on very heavy land; you must have a moderately light soil. On such soil this weeder will do a good deal of work in one day. It will go over about fourteen acres and cultivate and hoe them thoroughly. Keep the surface stirred up so that the weeds are destroyed while they are just about to start in the soil, and they never get started. So the work is not any more than many farmers put on a field in a bad year. They do as much work, but they have not the implements to do it so rapidly. We have now very many implements to reduce the cost of production. We can grow a crop of potatoes now and put them on the cars for just half the money we could fifteen years ago, and on the average we get as much for them as we used to; so you see there is a good chance to make a good deal more money out of them. That is one of the advantages of giving your attention especially to some single line of farming.

In the line of planting we put them in very much deeper than we used to. A potato planter will open the furrows and drop the seed and cover four or five acres in ten hours if the field is large; however, it won't do perfect work, but where the soil is sandy and light the planter will do. Our soil is heavy, most of it being a strong loam, and we find we cannot use a planter to advantage. We have gone back from the planter to the old way of planting; we have to drop by hand and it costs about $1 per acre. The best way on earth to mark out for potatoes is to mark the furrow with the plow. All your operations ought to be loose for the potato crop, exactly the reverse of the wheat crop. For wheat and corn make the ground solid. To plow out the furrows as we used to do fifteen or twenty years ago, one at a time, is too slow, so we attach two plows to a sulky. We had an arrangement made on purpose. I went to the carriage shop, and sat over the man till I got it done. We have two plows attached to the axle of the sulky, one with a right and the other with a left hand mould board, with the mould boards towards each other—good sized one-horse plows. We can gauge the depth by the sulky wheels, so that we can mark out on our clover sod, after having cut the sod and turned it up. Then the furrows are turned up together between the rows, and we have it in shape so that we can reverse the operation and turn over two rows at once, with another instrument something like the snow plow drawing the other ends to. These implements are the best I know of for planting and covering the potatoes. There is no patent on them; you can make them if you wish to. By plowing two furrows at once you can do it faster. We have got our rows so uniform that we can go once in a row and do good work on both sides. We have a field so long, and only go the long way of the field, and thus reduce the cost of production. There are hundreds of such little points, and you could not begin to figure on them, which we have studied just to produce the crop a few cents less every year. That is the way we have brought it down in the last fifteen years.

Q. How wide do you keep your lands?

Mr. TERRY: We have about six acres in each strip. We have six strips of about six acres each, and we plow each one in a land by itself, as a rule. We waste a little time in going across the ends. We have actually figured out that the loss of potatoes on one row where a dead furrow was, would more than pay for the loss of time in drawing the plow across the ends. That is a small matter, but there is possibly two or three dollars gone in that way on the field.

When it comes to handling the crop after it is grown, we have managed to reduce the cost of production one-half in that line. Not over fifteen years ago we used to dig potatoes and pile them in the field when we could not haul them to market as fast as we dug. We would select a spot large enough to make a fifty-bushel heap and then carry them to that heap. I have had forty heaps in that way in a field. Now, it is a great deal of trouble in handling these over. It took time to carry them together, it took time to get straw and cover up, and it took some time to pick them up from the pile with your hands. We found this took too much time, and we got bushel boxes made by the hundred that would hold a bushel level full, and we carted the boxes directly to the basement of the barn where we have storage for the potatoes, and we emptied them there on the floor, where we could shovel them up and not have to handle them, and they keep in better shape, and they are under cover and safe. We sort them, as a rule, when we pick them up. We manage to grow them in a good year so that we do not have any little ones. Take the Early Rose or Clark's No. 1, and we have grown a good many acres where the little ones would not pay for a man's time to pick them up. We scatter these boxes all down through the field, and two men pick up together. We take alternate rows, and give each man a row to pick up. They have just one thing to do. The men will complain that they could pick these up so much faster if we let them pick them all up clean. We put watchers on to watch them, and invariably they picked them faster when they have one row to pick up. If they are picking two rows at a time they waste their time. When there is just one row to pick they pick that row, and when they get the box full they leave it there. In that way we handle the crop for a good deal less money. We dig by machinery. There are two or three diggers made now on the elevator plan. They are very successful. The one we use cost $125. It is drawn by four horses. We dig four or five rows first thing in the morning, and then I take the leading team off, hitch them on to the wagon that will hold seventy-five bushel boxes in a load, and go down through the fields and scatter these boxes. I get to the back end just as the men have picked them up down there, and they set the boxes in the back of the wagon, and I will pile them up. It takes about ten minutes to put on a load of forty or fifty bushels, and I go to the barn and empty them and get more boxes. As soon as the men need more dug, we hitch on to the digger and dig more. Three hundred bushels is a very ordinary day's work. We have often put in about four hundred in one day with about four men. We calculate a good man will pick up about one hundred bushels. Of course in a poor season it would require more help. The larger the potatoes are the faster you can pick them up. I never feel so much that a farmer is somebody as when I get on that digger, and manipulate three levers and do the work of about fifteen men and do it easily. Not a great many years ago the horses stood in the barn and did nothing, while I paid men to dig the potatoes up by hand. This elevator digger takes them entirely from the ground up in the air, and free from vines and dirt. They are shook and left right on the surface of the ground in a narrow row behind, about eight or ten inches wide.

A MEMBER: Why let your potatoes back on the ground after you get them dug?

Mr. TERRY: That is a thing the manufacturers have been trying to get over for a long time, but they cannot, because no machinery can tell the difference between a potato and a clod of earth or a stone. On perfectly clean, sandy land, such as they have in New Jersey and Delaware, you might do it after a fashion; still I do not think you would be satisfied.

A MEMBER: Do you let your potatoes dry before picking them.

Mr. TERRY: No. Of course if they were wet enough that the dirt would stick to them it might be better; the potato keeps in the ground moist, so what is the good of drying them?

A MEMBER: In sorting them how deep would you put them in the cellar?

Mr. TERRY: Four feet; or three feet would be better. I had a pile sixty feet long and four feet deep right through the basement of the barn. Of course if there were any rotten ones you would not dare do that, but in an ordinary year we do it. I have given you an idea of how we have worked to reduce the cost of production. Now, I often go by a farm in our locality where there is a farmer and his son, a full grown young man, working along in the old way just as we used to work twenty odd years ago. They put the potatoes in and let the weeds and the potatoes grow up together. They put them in and plow one furrow at a time. The old gentleman holds the plow and the young man leads the horse, and they cover them in the same way. There are thousands of farmers who do not do much better. They take them up by hand in the fall, and by the time they get these potatoes they cost them more than they are worth. They had better work out for somebody for wages. That man is growing poorer and poorer right along, while we are growing richer and richer. It comes from taking one line of business best adapted for our soil under the circumstances, and studying over it in every way. That is the way in which we have made a little money on our farm. We may check the evaporation of moisture better if we would cultivate three or four inches deep. The soil was made for the roots to grow in; we want to disturb the roots as little as possible. Before our potatoes are six inches high the roots are all over between the rows. Two inches will check the evaporation all right, and won't disturb the roots to amount to anything. When you hill up your potatoes you tear up the roots, and in a dry year this would be injurious; and more than that, if your soil is at all heavy when you hill up the potatoes you make a nice lot of ditches between the rows and allow the water to run off when the showers come in summer, and that is the worst thing you could do. Water is what you want in the potato field.

A MEMBER: How do you select your seed?

Mr. TERRY: We prefer to take the best potatoes. Practically we take the best portion of the field to take our seed from. For some years I followed up by selecting the best hills and the best tubers in the hills, and by so doing we found we could improve the variety. This is hardly practicable for extensive growers.

A MEMBER: About how many eyes do you leave?

Mr. TERRY: We cut to one eye, but I would not advise you to do it unless you understand all the conditions. You want fertile soil, plenty of vegetable matter and sound seed that is not sprouted, and then the best of cultivation. I can grow more dollars per acre from seed cut to one eye than in any other way. We commenced cutting at the stem end; but the first eye at the stem end is often a weak one; if it is a little bit of an eye we pay no attention to it. We just cut with a slanting cut. When we get up to the upper end and have a piece left about the same size as the other piece, there is a cluster of eyes on that and usually one or two eyes around the edge separated from the cluster. We just shave off the cluster and throw it away, thus destroying that cluster of eyes and leaving one or two eyes at the edge. Then you have a piece which is as good as the other ones; it would not do to split that cluster up to one eye. I would rather plant just after I cut. We plant the seeds from twelve to fifteen inches apart in the row, according to the variety, and according to the size we want the potatoes. If you want large ones plant a little further apart.

Mr. TERRY: We have not had much trouble with the Colorado bug of late years. All we do is to pick the first beetles that appear for the first few days, perhaps two weeks, and after that there are not many come on.

Q. How do you handle seed potatoes from the time you pick them?

Mr. TERRY: We put them in the cellar first. As soon as the earth is cooler than the cellar, which would be early in November, we bury them outside and keep them there till spring, making two air spouts overhead. That is, we put on a covering of straw and then a covering of earth and when frozen in the winter put two or three feet of straw mulch over the whole end, covering it all over deep,, keeping the frost out in that way. We can keep early potatoes till pretty near the first of June, before sprouting.

Q Do you ever sprout the seed for early potatoes?

Mr. TERRY: No. I would rather they would not start at all until put in the ground. If you wanted to have early ones you might do it, but for field culture I would not do it. I know some have done it, but I see nothing gained by it. Potatoes that lie in the ground all winter are the ones that come up the strongest in the spring.

Q. How deep do you put them in?

Mr. TERRY: Four inches on our drained land; but if the land was not drained that might be too deep.

Q. If you don't hill them at all won't these large varieties get sunburnt?

Mr. TERRY: Practically we cannot grow them without hilling a little. There is a little dirt turned to them. I suppose the ridges are two or three inches higher than between the rows.

Q. How far apart are your rows for early potatoes?

Mr. TERRY: We have settled on 32 inches, perhaps 33 would be better, because that would give you exactly six rows to the rod. If you want them larger plant them a little further apart.

Q. What varieties do the best?

Mr. TERRY: We have made most money out of potatoes like the early Hebrons, New Queen, Clark's Number One. Of course that is largely a matter of locality, there are farms in our township where potatoes will not do well, that do well for me. No man can tell except by actual experiments on his own land what potatoes are best to grow.

Q. Did the Freeman do well with you?

Mr. TERRY: It does with this exception that it is inclined to start a great many potatoes, and they cannot all grow large. By cutting to one eye and planting far apart we have good results. If I wanted to grow the most bushels possible on an acre, if my life depended on it, and I could have everything I wanted to work with, I would grow the Freeman, but to grow to ship by the carload I would not do it, because they would not sell on their merits. I can grow a larger, coarser potato that will sell better in a market where they are not tested.

Q. What style of weeder do you use?

Mr. TERRY: I have two kinds of weeder, the Original weeder, but Bread's Universal weeder is the best one I have.

Q. Do you try seed potatoes from different soils?

Mr. TERRY: It is better to get seed from a soil better than your own. We send north for our seed because it is better. Up in the northern part of Maine the potatoes grow splendidly.

Q. Have you tried fertilizer on your potatoes?

Mr. TERRY: We have tried it, but with no good results whatever.

Q. You strongly advocate underdraining, and then you say for this potato growing you want to retain the moisture?

Mr. TERRY: The underdrain only takes up the surplus water that would be injurious. It is not taking the water from the subsoil but simply from the seed potato, the surplus that would otherwise be injurious. The water does not run away when it comes from the crops when the drains are properly put in. The water should soak down into the earth, and fill the earth up and when it gets all the water it wants it runs off and with plenty of vegetable matter in the upper soil it holds more there.

A MEMBER. I thought if we had a dry season it would be better to stop up the outlet.

Mr. TERRY: It is a fact that on well tile drained land in a dry season you could raise better crops than you can on land that is not well drained. I always do my own tile draining. I won't trust anybody else with it, because it is something like a doctor's mistake—they are all buried, you cannot tell anything about them I do not put any straw on top of the tile, I put the tile close together. I generally lay the tile from two and a half to three feet deep. Some of them are put in four feet, where our subsoil is heaviest we put tile in every two rods.

Vote of Thanks to Mr. Terry.

Moved by Dr. Mills, seconded by R. F. Holtermann, that the members of the Experimental Union and others present return their sincere thanks to Mr. Terry for the very excellent addresses with which he has favored them; that they express their high estimate of Mr. Terry's ability, and their appreciation of the great services which he has rendered to the cause of agriculture on this continent. They have been greatly pleased with the simple, direct, and eminently practical character of Mr. Terry's addresses; and they beg him to accept this very inadequate expression of their appreciation. Carried.

TREASURER'S REPORT.

——	Dr.	Cr.
	$ c.	$ c.
To balance from last year, including members' fees	75 03	
" Government grant	700 00	
" Additional members' fees	12 50	
By grains, fertilizers, postage, expressage, printing, etc. (agricultural experiments)		454 47
" small fruit plants, printing, postage, etc. (horticultural experiments)		50 00
" bees, printing, postage, etc. (apicultural experiments)		28 46
" printing (committee on botany and entomology)		5 00
" reporting, editing, etc.		95 00
" travelling expenses of officers, printing programmes, circulars, etc.		52 51
" Secretary's salary		25 00
" expenses of speakers at meeting		44 76
" balance on hand		32 33
Total	787 53	787 53

Auditors' Report.

We, the undersigned auditors of the Ontario Agricultural and Experimental Union, beg leave to say that we have examined the accounts of the Treasurer and find them to be correct.

(Signed) L. W. Lang,
T. F. Patterson.

After considering the requirements of the different committees on experiments for 1895, Messrs. Holtermann and Lick were appointed a committee to wait upon the Honorable Minister of Agriculture, with the object of having the Government grant increased to $1,000 during the coming year. The Union was grateful to the Government for the grants received in the past, but believes that the value of the results of the co-operative experiments are worth many times their cost to the farmers of Ontario. The committees on agricultural, horticultural and apicultural co-operative experiments could all extend their work over Ontario to great advantage with the grant increased to $1,000, but the work cannot be extended much beyond its present scope unless the grant to the Union be increased for 1895. A new committee on live stock Experiments has been appointed at this meeting, and if this committee carries on any co-operative experimental work, some money will also be required for this.

After a vote of thanks to the retiring officers had been passed, the sixteenth annual meeting of the Agricultural and Experimental Union was brought to a close at about 5 p.m.

TWENTY-FIFTH ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY

OF

ONTARIO

1894.

(PUBLISHED BY ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

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1894.

CONTENTS.

PROFESSOR WILLIAM SAUNDERS, F.R.S.C.

Director of the Experimental Farm of the Dominion of Canada. President of the Entomological Society of Ontario, 1875-86. Editor of "The Canadian Entomologist," 1874-86.

AUGUSTUS RADCLIFFE GROTE, A.M.,

Honorary Member of the Entomological Society of Ontario (Elected Nov. 10, 1868); Vice-President of the American Association for the Advancement of Science, (1878), etc., etc.

TWENTY-FIFTH ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY OF ONTARIO

1894.

To the Honorable the Minister of Agriculture:

SIR,—I have the honor to submit for your approval the twenty-fifth annual report of the Entomological Society of Ontario. The Council feels a pardonable pride in drawing your attention to the fact that they have now completed a quarter of a century's work in the investigation of the life histories of insects and their relation to agriculture and horticulture, and have embodied the results of their researches in twenty-five annual reports and twenty-six volumes of the *Canadian Entomologist*. This somewhat uncommon success in the case of a voluntary scientific society is, they feel, largely due to the support which has been received from the Legislature of Ontario, and for which they desire to record their grateful thanks.

The President's address and the various papers on economic and general entomology which are contained in the accompanying report will be found, it is trusted, as interesting and as useful as on previous occasions.

I have the honor to be, Sir,

Your obedient servant,

W. E. SAUNDERS,

Secretary.

OFFICERS FOR 1895.

President	W. H. HARRINGTON	Ottawa.
Vice-President	J. W. DEARNESS	London.
Secretary	W. E. SAUNDERS	do
Treasurer	J. A. BALKWILL	do
Directors :		
Division No. 1	JAMES FLETCHER	Ottawa.
" 2	REV. C. J. S. BETHUNE	Port Hope.
" 3	GAMBLE GEDDES	Toronto.
" 4	A. H. KILMAN	Ridgeway.
" 5	R. W. RENNIE	London.
Librarian and Curator	J. A. MOFFAT	do
Auditors	J. H. BOWMAN	do
	J. M. DENTON	do
Editor of the "Canadian Entomologist"	REV. C. J. S. BETHUNE	Port Hope.
Editing Committee	J. FLETCHER	Ottawa.
	H. H. LYMAN	Montreal.
	REV. T. W. FYLES	South Quebec.
	J. M. DENTON	London.
	J. H. BOWMAN	do
Delegate to the Royal Society	REV. T. W. FYLES	South Quebec.
Committee on Field Days	DR. WOOLVERTON, MESSRS. MCCLEMENT, ELLIOTT AND STEVENSON	London.

ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY.

The thirty-second annual meeting of the Entomological Society of Ontario was held in its rooms in Victoria Hall, London, on Wednesday and Thursday, November 7th and 8th, 1894, the President, Mr. W. H. HARRINGTON, F.R.S.C., of Ottawa, occupying the chair.

The meeting was called to order at 3 o'clock p.m. on Wednesday, when the following members were present: Rev. T. W. Fyles, South Quebec; Mr. H. H. Lyman, Montreal; Mr. James Fletcher, Ottawa; Rev. C. J. S. Bethune, Port Hope; Capt. Gamble Geddes, Toronto; Messrs. J. M. Denton, J. A. Balkwill, W. E. Saunders, J. A. Moffat, J. W. Dearness, W. Stevenson and H. P. Bock, London. A letter of apology was read from Mr. J. D. Evans, of Trenton, regretting his inability to attend the meeting.

After discussing the question of obtaining more suitable and commodious rooms for the society, which was also considered at the evening session, the first paper on the list was read by Capt. Geddes on "Some of the Insects of Bermuda collected during the Winter of 1893-4." The writer brought a number of interesting specimens to illustrate his remarks. Observations were made upon the paper by Dr. Bethune, who had visited the islands during the two previous winters and had found very few insects of any kind; the only butterflies he saw were *Danais Archippus* and *Junonia Cœnia*, a few Geometer moths and Plusias flying about the lantana blossoms at dusk, and some beetles of the family Scarabaeidæ. As Capt. Geddes's visit had extended over four months his opportunities were very much greater and he had succeeded in making a very interesting collection.

Capt. Geddes gave an account of a remarkably late brood of the Camberwell Beauty butterfly, *Vanessa Antiopa.* He found the larvæ feeding on the yellow and partly faded leaves of a young elm tree in his garden, which they nearly stripped of its foliage; many of the caterpillars fell to the ground with the falling leaves on which they fed. The butterflies from this brood came out in the house on the 6th and 7th of November.

Mr. Lyman gave an account of his observations of the various broods of *Vanessa Milberti.* Hibernated specimens of the butterfly appear in early spring; the first brood from these was flying on the first of July, and colonies of larvæ were found feeding on nettles early in the month. Very young larvæ were found again on the mountain at Montreal on the 20th of August; these became full grown on the 13th of September and changed to pupæ on the 18th. Late in October the full colors of the butterfly were showing through the chrysalis case, but when he left home on the 5th of November, the butterflies had not emerged. Mr. Scudder, in his work on butterflies, states that this species has three broods in the New England States. Mr. Lyman thought that those now in the pupa state were the third brood at Montreal.

Dr. Bethune exhibited some specimens of rare Lepidoptera that he had taken this summer. Among them were *Limenitis Proserpina*, captured at Roach's Point, Lake Simcoe, on the 22nd of August; *Sphinx luscitiosa*, attracted by light at Port Hope, in June; a variety of *Catocala ilia* taken at sugar in July; *Plusia venusta*, Walk. (*striatella* Grote), attracted by light; an immaculate specimen of *Pieris rapæ*, etc. Mr. Fletcher stated that *L. Proserpina*, though excessively rare, had been taken at Rideau Hall, Ottawa.

Mr. Lyman read an interesting paper on "Common Names for Butterflies, Shall We Use Them?" In the discussion that followed Mr. Fletcher stated that common names would be given for all the Canadian species of butterflies in the handbook that he and Dr. Bethune were preparing for publication. The general opinion of those present was that it is highly desirable that ordinary English names should be used as far as practicable in order to promote the study and observation of insects.

Dr. Bethune then read "A List of the Butterflies of the Eastern Provinces of Canada," which contained no less than 116 species, of which the localities and in most cases the food plants and times of flight were given. The paper was commented on by Capt. Geddes, Messrs. Fletcher, Fyles and Lyman, who contributed much interesting information regarding a number of the species.

Mr. Fletcher exhibited specimens and gave an account of the remarkable habits of the moth *Exyra Rolandiana*, the larva of which feeds upon the leaves of the pitcher plant, *Sarracenia purpurea.* He also exhibited an interesting collection of butterflies sent by Mr. Green, of British Columbia, and gave an account of a visit he made to Sudbury in May last, when, notwithstanding a snow storm that prevailed, he procured the larva of *Pamphila metacomet*, which fed on carex, and which he succeeded in rearing. He made some interesting remarks upon *Colias elis*, *nastes* and *interior*, and gave an account of a rearing of *Colias eurytheme*, the eggs of which he had obtained at Nepigon in June. When the chrysalids were beginning to show the color of the butterfly he retarded their development for some weeks by placing them in a refrigerator, while emergence was hastened by exposure to electric light. He also showed some specimens of *Papilio Bairdii* and *P. Oregonia* received from Mr. Edwards, who had this year added yet another to his laurels by proving that these very dissimilar butterflies were really dimorphic forms of one species. Mr. Edwards had gone to Colorado and with great care had bred broods of larvæ from eggs laid by both forms and had obtained from each brood some of both kinds of the butterflies named. This, the speaker said, he considered one of the greatest triumphs of this wonderful man He had had the great pleasure of meeting Mr. Edwards in his own beautiful home amongst the mountains of West Virginia, where he hoped he would long be spared to carry on his useful studies with his characteristic energy, perseverance and accuracy.

Mr. Fletcher next exhibited specimens of *Pamphila metacomet* in all stages, egg, larva, pupa and cocoon and perfect butterfly, as well as an egg parasite, which had been named by Mr. Ashmead *Telenomus pamphilæ*, n.s. It was agreed at the last annual meeting that each member should try to work out the life history of at least one insect in time for this meeting: he had devoted his attention to *P. metacomet*, which is as a rule rarely taken at Ottawa. This fact, however, he thinks has been due to a want of knowledge as to its habits. He had previously taken the butterfly only in open glades in a wood, but the larvæ feed on carices growing on exposed rocks. The food plant of this species as well as that of *P. mystic*, which he had also bred this year, was, he thought, not grasses, but sedges (carex), although in confinement they would eat grasses. The eggs are laid in July and the caterpillar passes two or sometimes three moults the same autumn and then hibernates in a case made by spinning three or four of the leaves of the food plant together. The larva is pale green, closely lined all over with broken white lines and covered with minute black piliferous tubercles. The most remarkable part of the larva is the head which is ornamented differently from that of any other species of the genus he was acquainted with. On the front, at the apex, is a large, velvety black area edged with white, and down either side of the face run two white lines with a dark area between them; behind these lines the head is black. The thoracic shield is ribbon-like, double, white in front, black behind. Just previous to pupation two large, white patches were plainly visible through the skin beneath segments 11 and 12. When ready to pupate the larva spins a close cocoon, similar to that of *Acronycta oblinita*, the end of which is stopped up with a silvery white, flakey powder which is emitted through the skin (apparently) from the two white patches mentioned. In three or four instances the pupa worked its way out of the cocoons and fell to the ground. It is piceous, when cleaned of the white silvery powder, slender and much elongated. The tongue case protrudes beyond the wing cases as in *Pamphila cernes*, etc. The abdomen beneath is closely covered with tawny bristles which are thickest at the cremastral end. The end of the body is furnished with about six short blunt spikes and on each side two larger ones. A more detailed account of the stages will appear later in the *Canadian Entomologist.*

The Rev. T. W. Fyles read a short paper on "*Catastega aceriella-Semasia signatana.*" In answer to an enquiry whether *Nematus Erichsoni*, the Larch saw-fly, was still at work, he stated that it was still operating in the Province of Quebec, but in greatly reduced numbers. A tree here and there had been stripped this summer; in some cases part of the tree only had been affected. The insects were now attacking young trees—those from about ten to twenty or more feet in height. They seemed on their first arrival to pass by these, he supposed because the foliage of the more mature trees was more palatable to them. Some trees near Quebec that had been badly attacked and that he once thought would die, seemed to have made a struggle for life and had sent out numbers of small twigs on the stems and main branches, so as to present a very scrubby appearance. He had not been able to visit the large swamps in the Townships, but he believed the state of things there to be such as he had described in the society's Reports. He had been surprised to find in parts of the Gomin swamp affected by drainage numbers of small tamaracks from six inches to several feet high, where a few years ago none were to be seen. Mr. Harrington stated that in Cape Breton also he found young tamaracks growing up.

Mr. Fyles next gave an account of a strange food for the larvæ of *Pyralis farinalis.* He said that in the society's Report for 1893, page 42, he gave a description of a *Lithocolletis* larva that he found feeding in blisters on the leaves of the white hazel, and which he hoped to rear. When full fed the larva spun a cocoon inside the blister, but his hope of obtaining the perfect insect was defeated in a strange manner. One the 3rd of March he examined the glass jar in which he had stored the blistered nut leaves, and over which he had tied a muslin cover. To his great surprise he found a number of Pyralid larvæ feeding upon the leaves. He described them as follows: Length, when extended, nine-tenths of an inch; head and prothoracic and anal plates, nut brown; the rest of the body, lead color: dorsal line, black. The appearance of the larvæ seemed familiar to him, but he let them be. They ate up the nut leaves, leaving only a tangle of the ribs and veins In due time they produced a number of fine specimens of the moth *Pyralis farinalis,* Linn.

Mr. Fyles stated that he wished to rectify a mistake. In the list of captures on page 41 of the annual Report for 1893 occurs the name *Anisota senatoria*; it should be *Anisota virginiensis,* Drury.

Mr. Harrington exhibited a collection of beetles from Japan, many of which were very beautiful and remarkable.

Mr. Lyman showed a box of specimens collected by Mr. Bean, at Laggan, Alberta, among which was a series of the moth *Nemeophila petrosa.* An excellent photograph of these had been made, and it was resolved, on motion of Mr. Fletcher, seconded by Dr. Bethune, that Mr. Lyman be requested to have a plate prepared for publication in the *Canadian Entomologist.*

Mr. Fletcher exhibited a small collection of diurnals which had been sent down for identification by Mr A. W. Hanham, of Winnipeg. Attention was drawn to specimens of *Thymelicus Garita,* this being probably the most eastern record; *Lycæna Melissa, Thecla Acadica* and three specimens of *Thecla strigosa,* all of which showed the large fulvous spots similar to the specimen figured by Boisduval and Leconte as *T. Liparops.* This form was very rare at Ottawa, the speaker having taken only two specimens in many years.

While on his feet Mr. Fletcher said he wished to mention that a good deal of work had been done during the past season in collecting insects in distant places in Canada

Mr. A. P. Low, of the Geological Survey, had made a collection of diurnal Lepidoptera and Coleoptera in his journey across Labrador, specimens of *Pyrgus centaureæ, Chionobas jutta* and *Colias Scudderii* were exhibited. Dr. G. M. Dawson and Mr. J. McEvoy had collected in the mountains about Ashcroft, B.C.; Messrs. C. de B. Green and Edmund Reynolds had made large and valuable collections of Lepidoptera in the mountains at Osoyoos, B.C., just north of the boundary of Washington State. Specimens were exhibited of *Papilio Daunus, Oregonia, Rutulus var Arizonensis, Turnus, Satyrus Œtus, S. Ariane, Lycæna sagittigera, L. Heteronea, Pieris Beckerii, Colias Emilia, Anthocaris Sara, A. creusa, Thecla dumetorum, Pterogon Clarkiæ* and many other rarities. Mr. Fletcher was glad to be able to announce that Mr. Green intended next year to collect as a business. His address for the present is Osoyoos, B.C., and intending purchasers would do well to correspond with him at once. Mr. Green and Mr. Reynolds had both added new species this year to the Canadian list. At Calgary Mr. C. Wolley-Dod had done good work in collecting and providing Mr. W. H. Edwards with eggs of *Chionobas Alberta*, the larvæ from which had been successfully taken through all their stages. At Olds, 40 miles from Calgary, Mr. T. N. Willing had also done good work, and had taken, among other rarities, *Erebia discoidalis* and *Argynnis Edwardsii*. Prof. John Macoun had this year collected at Crane lake, in the same district, and had added *Hipparchia Ridingsii* to the Canadian list. In Alaska collections of insects had been made by Messrs Otto Klotz and W. Ogilvey, of the Boundary Survey, as well as by some of the other members of the party This material was chiefly diptera, coleoptera and hymenoptera. It had not as yet been worked up. In the Rocky Mountains Mr. T. E. Bean continued his studies. Through his kindness eggs had been received by the speaker of *Colias Elis*, of which bred specimens of the larvæ and imago were exhibited, *Colias nastes* and other rare species. Some beautifully blown larvæ prepared by Mr. Bean were shown. Mr. W. McInnes and Mr. J. C. Guillim, of the Geological Survey, had collected east of Port Arthur, the latter gentleman taking *Euptoieta Claudia* at Wabigoon, on the C. P. Ry. In Manitoba collections had been made by Mr. Hanham at Winnipeg, and a very remarkable collection by Mr. E F. Heath, near Cartwright, Man., some most surprising captures had been made as *Vanessa Californica*, *Nathalis Iole*, and a Thecla which is probably undescribed. Mr. Heath has also sent the cocoons of some splendid specimens of *Samia Columbia* which were exhibited, and compared with specimens found at Ottawa on tamarack. The northwestern food of this species is *Elæagnus argentea*, and the moths are always distinguishable by their much redder hue.

Mr. Harrington gave some interesting "Notes on Canadian Coleoptera," relating how he had obtained a hair snake from a Coccinella, and found the larvæ of a beetle, *Brachyacantha ursina*, feeding upon plant lice in an ant's nest, with other noteworthy matters, which will be found detailed in his paper.

The meeting adjourned at 6 o'clock p.m.

EVENING SESSION.

In the evening the society held a public meeting in its rooms in Victoria Hall, at which there was a largely increased attendance of members, between thirty and forty being present. Besides those already mentioned at the afternoon meeting, the following were noticed: Messrs. R. W. Rennie, J. G. Wilson, J. H Bowman, Dr. S. Woolverton, J. H. Pearce, W. T. McClement, W. Scarrow, etc.

The chair was taken by the President, Mr. Harrington, at 8 o'clock. After apologizing for the absence of Mr. Kilman and Mr. Evans, the Chairman called upon the Secretary to read the

REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario beg to present the following report of their proceedings during the past year:

They are happy to congratulate the members of the society upon the steady increase in numbers which continues to take place, and the hearty interest that is maintained in the various departments of work.

The twenty-fourth annual report on Economic and General Entomology was presented to the Minister of Agriculture in November last, and was printed and distributed at the beginning of January. It consisted of one hundred and eleven pages, a much larger number than usual, and was illustrated with thirty-nine wood cuts and a portrait of the Editor, who was for several years President of the society. Among the more important and interesting papers may be mentioned Mr. Fletcher's account of "The Injurious

Insects of the Year 1893"; the President's Address; "Entomological Mistakes of Authors," by the Rev. T. W. Fyles; "Mosquitoes," by Mr. Moffat; "Dragon Flies," by Mr. McLaughlin; "A Contrasted Summary of the Main External Characters of Butterflies in Their Different Stages of Life," by Mr. S. H. Scudder, and a report of the fifth annual meeting of the Association of Economic Entomologists, together with a number of the principal papers.

The *Canadian Entomologist*, the monthly magazine published by the society, has been regularly issued at the beginning of each month, and completed its twenty-fifth volume in December last. It consisted of 334 pages, being the largest number yet published. Of the twenty-sixth volume eleven numbers have already been issued; the increase in the number of pages has been more than maintained, 328 having been already published. No less than fifty-two wood cuts have been used to illustrate papers, a large proportion of them being new and original. Among the many valuable and interesting papers that have been published, mention may especially be made of the series of illustrated articles on the "Coleoptera of Ontario and Quebec," by Mr. Wickham, which are intended especially to assist beginners in naming their specimens, and to lead them on to a more thorough study of the order. The list of contributors includes the names of the most eminent entomologists in North America, as well as several in Europe.

The collections of specimens belonging to the society have been increased during the past year by the addition of a number of coleoptera new to the Canadian lists by Mr. A. H. Kilman, of Ridgeway, and a collection of insects from San Domingo. Improvements are also being steadily made by the substitution of fresh specimens for those that are faded or imperfect in the cabinets.

The geological, microscopical and botanical sections of the society have held regular meetings during the past season and have done much good work, as is shown by their respective reports. It is to be regretted that the ornithological section has not been so active as in former years, but it is trusted that interest in this department will speedily be revived.

The treasurer's report is highly satisfactory. The expenditure on the *Canadian Entomologist* has necessarily been increased by its enlargement, but this has been fairly met by the steady growth in the number of subscribers and by the sale of back volumes. The balance on hand at the close of the financial year is $360.50. This will be entirely absorbed by the necessary expenses of the remaining months of the year. The Council take this opportunity of recording their appreciation of Mr. Balkwill's services as treasurer and the satisfactory mode in which his accounts are kept.

The society was represented at the annual meeting in Ottawa of the Royal Society of Canada, in May last, by the Rev. T. W. Fyles. We have much pleasure in recording that two of our members were elected fellows, namely, our President, Mr. W. H. Harrington, and the Rev. G. W. Taylor, of Nanaimo, B.C.

All of which is respectfully submitted.

W. E. Saunders,
Secretary.

REPORT OF THE LIBRARIAN AND CURATOR.

Mr. J. A. Moffat presented and read his report as follows:

I beg leave to submit my report for the year ending 31st of August, 1894.

Seventy-seven volumes have been added to the Library during the year; these include bound volumes received from public institutions and scientific societies, exchanges collected and bound, also books obtained by purchase.

The more important of the bound volumes received are. The Reports of the Missouri Botanical Garden for the years 1891 and 1893.

Annual Report of the Ontario Department of Agriculture for 1892.

The Smithsonian Report for 1891.

Report of the New York State Entomologist for the years 1891 and 1892.

Report of the New York Agricultural Experiment Station for 1892.

Reports of the New York State Museum for the years 1892 and 1893.

Proceedings and Transactions of the Royal Society of Canada for 1893.

Iron-bearing Rocks of Minnesota.

Added by purchase: A popular handbook of the Ornithology of the United States and Canada, based on Nuttall's Manual: by Montague Chamberlain, 2 volumes. All the Entomological writings, up to date, of J. W. Tutt, F. E. S., England, editor of "The Entomological Record and Journal of Variation." Also his instructive and amusing book entitled, "Random Recollections of Woodland, Fen and Hill"; seven volumes in all. These were obtained in exchange for back volumes of the *Canadian Entomologist.*

There are now four hundred and eighty-five pamphlets in the Library, bound in twenty-seven volumes. These volumes are labelled "Pamphlets," and numbered consecutively from 1 to 27, but have their number in the Register according to the time they were bound and placed in the Library. The pamphlets are numbered in order, and catalogued in a book by themselves, giving the Library number as in the Register, the number of the pamphlet volume, the pamphlet number, with the author's name, the subjects, and the date of issue where obtainable.

The whole number of volumes on the Register is now 1,361. The number of volumes issued to local members during the year was forty-four.

Additions are still being made to the Society's collection of native lepidoptera by the capture of species hitherto unrepresented therein; twenty named forms being added during the year, which had not before been published as Canadian. There are now 1,077 named forms in this department, as against 930 in 1892. A steady improvement in the quality of the collection is also being made by the replacing of such as are not in perfect condition, with fresh material obtained by capture or exchange.

The first important addition to the Society's collection of native Coleoptera for several years was made by Mr. A. H. Kilman, of Ridgeway, Ont., in a donation of a hundred and fifty species.

A small but highly interesting collection of Santo Domingo insects was presented to the Society by a friend, the captures of his sister, Miss Davida Rougoie, who is at present a resident of that island. The most noticeable feature of it being three specimens of *Mantis* of strikingly different form, color and ornamentation, indicating that it is an abundant family in that locality.

Through the kindness of Mr. A. P. Morse, of Wellesley College, Mass., the Society has been put in possession of representative specimens of three species of New England *Spharagemon*, also his paper, historical and descriptive, of the same.

All of which is respectfully submitted.

J. Alston Moffat,
Librarian and Curator.

The President then read his annual address, which was listened to with great interest and attention:

ANNUAL ADDRESS OF THE PRESIDENT.

BY W. HAGUE HARRINGTON, F.R.S.C., OTTAWA.

"An ant slow-burrowing in the earthy gloom,
A spider bathing in the dew at morn,
Or a brown bee in wayward fancy borne
From hidden bloom to bloom."

—*Lampman.*

GENTLEMEN,—My first duty to the members of the Entomological Society is to sincerely thank them for the honor which they conferred upon me in re-electing me to be their President, notwithstanding my inability to be present with them at the last annual meeting. Those among you who may afterwards have read my address, as printed in the Annual Report, may perhaps have congratulated yourselves that I did not appear at the meeting and read it to you in extenso. You need not, however, be alarmed lest you have to listen to such an over-lengthy document on this occasion.

My good friend, Mr. Fletcher, has kindly consented to address you on the injurious insects of the past season, and thus I am relieved of a task for which he is more competent, and for which his official duties so fully qualify him. You shall, I rest assured, find his remarks to be most interesting and profitable to you, both as regards economic and scientific questions.

The Report prepared by the Council will inform you as to the work performed by the Society during the year, and as to its present financial standing and prospects, so that, with regard to these points, I need merely express my sense of a lively satisfaction in the knowledge that continued prosperity and success crown the efforts which you are making to advance an interest in, and a truer knowledge of the attractive and deeply interesting science of entomology, for the study of which you have been banded together for so many years.

After careful consideration of several topics which occurred to me as worthy of your attention, I decided that a brief review of the results of the past twenty-five years might not be unprofitable. I shall base my remarks upon the volumes of the *Canadian Entomologist*, and shall afterwards endeavor to indicate the direction in which future work may be advantageously undertaken. The splendid series of twenty-five volumes of the *Canadian Entomologist*, which have already been completed, constitute a veritable treasure-house of information regarding the insects of North America. The value of their pages has been greatly increased by the constant contributions from the leading entomologists of the neighbouring Republic, and by frequent articles from European correspondents. The valuable papers received from these sources have dealt largely with the Canadian fauna, and have often been based upon the captures of our members in Canada, but my present remarks will be confined to a discussion of the work of our home members as recorded by themselves. These laborers have ever been few in proportion to the vast extent of country of which it is our privilege and duty to investigate the insect life. We need not be surprised, therefore, because the investigated districts are very limited in comparison with the still unexplored fields which are waiting to yield up their treasures to the careful investigator. The areas in which systematic and sustained work has been done are, in fact, so few and so limited in extent, that on a map they appear almost as mere starting-points.

It is worthy of note that the labors of editing the twenty-five volumes of the *Entomologist* have devolved equally upon Prof. Saunders and Dr. Bethune; each of these gentlemen having edited twelve volumes and shared in the editing of volume eighteen. The Society has owed much to the zeal and work of these gentlemen, whose contributions appear in nearly every volume, and much exceed the efforts of any other member. Among their contributions are many valuable papers on our lepidoptera, containing descriptions of their earlier stages, and also of some new species. Another series of very interesting and valuable papers was that "On Some of our Common Insects," designed to arouse the interest of some of those who might be taking up the study of entomology, and to stimulate them to become earnest workers. We are glad to know that these learned friends, who have, in the past, done so much for our Society and for the study of entomology, are still connected with us in the work which we are carrying on. Dr. Bethune continues to be our efficient editor, and under his wise and careful direction our publication continues steadily to improve, and to hold a foremost place in entomological literature. Prof. Saunders, although called to a position making great demands upon his time and strength, still keeps up his interest in our special line of scientific work. A few years ago he embodied his researches in that excellent treatise on "Insects Injurious to Fruits," which, since its appearance, has been a standard work, and has had a very large circulation throughout North America.

One of the most useful and important features of the earlier volumes was the compilation by Dr. Bethune, from Kirby's Fauna Boreali-Americana, of the "Insects of the Northern Parts of British North America" (afterwards republished as a separate volume), which placed the descriptions of a great many of our insects in the hands of students who might not otherwise have been able to obtain them, the original publication being very rare.

Before commencing this address I made a list of some fifty Canadian contributors, the majority of whom still continue to send in valuable papers. Several, however, have passed to the "Happy Hunting Ground" beyond the "Great Divide," while others have either removed from the Dominion, or through pressure of business and new occupations, have ceased to contribute; though in some cases still keeping up their collections and their interest in the study and work of the Society. My intention is not to go at length into the writings of individual members, nor can I make any reference to the many valuable papers specially prepared for the Annual Reports furnished to the Ontario Government. But I shall try to bring my subject before you in two ways: first, from a geographical standpoint, that you may see in what districts our insects have been studied; secondly, from a systematic point of view, that you may see which orders have received attention, and which have been, in whole or in great part, neglected.

As our Society is provincial, in so far as regards its name and the liberal support which it annually receives from the enlightened Legislature of Ontario, so the larger portion of the work accomplished by it has naturally related to the insects of the Province in which it was organized and by which it is sustained. A good starting-point for our proposed tour of inspection will be London—the beautiful city in which we are now met, and which, as the headquarters of the Society, has been for many years the Entomological Mecca to which we annually resort to renew our strength and zeal in the good work, and to arrange our plan of campaign for the coming year.

Here Prof. Saunders toiled for many years, and, with the later assistance of his sons, made most extensive collections. His papers do not, however, include any lists of the species which he collected in the various orders, and the same remark may apply to Messrs. Denton, E. Baynes Reed, Williams and others whose captures have so largely enriched the collections of the Society. The London members, however, had for many years almost the entire management of affairs of the Society, and the preparation of the Annual Reports, the arrangement of the collections, the care of the library, etc., occupied much time that might otherwise have been devoted to special lines of research.

At Grimsby Mr. J. Pettit, in the earlier years of the Society, was a very skilful and assiduous collector, and his list of the coleoptera taken in that neighborhood, which he commenced in the first volume, is one of the most complete local catalogues yet published in Canada. The Hamilton district has been investigated by such competent collectors as Messrs. Moffat, Murray, Johnston and Hanham. The first of these gentlemen has made many valuable contributions to our publications, and is now continuing his good work in London, where he has the charge of the collections and library. Mr. Geo. Norman, of St. Catharines, published a very interesting list of the Noctuidæ captured there by him. At Ridgeway we find a member of our Council, Mr. A. H. Kilman, who has made extensive collections in what seems to be a very rich district; but while he has added largely to the knowledge of our insects, he has not yet published as much regarding them as we should like him to do.

Toronto, as the chief City in Ontario and the seat of various and important institutions of learning, should furnish us many capable investigators, but I find that the workers there have never been numerous; nor do the local natural history societies appear to have done much to develop them. I must mention, however, our first President, Prof. Croft, with Mr. W. Brodie and Capt. Gamble Geddes. Mr. Brodie has accumulated large collections, and he has published a few interesting articles in our magazine (and more recently in the "Biological Review of Ontario,") upon various gall-forming insects. Capt. Geddes has been a most enthusiastic gatherer of lepidoptera, amassing a collection of butterflies unequalled in Canada, and which has since been purchased by the Geological Survey of Canada. His interesting papers upon Canadian butterflies appear in several volumes of the *Entomologist.*

Port Hope has been the home of Dr Bethune, so we may rest assured that the country round about has been well investigated. I have not yet had the pleasure of seeing his fine collections, and as regards the extent and value of his writings upon our insects I have already spoken. At Belleville we have had such well-known collectors as Prof. J. J. Bell and Prof. Macoun. The former paid much attention to the smaller forms of coleoptora, and was a frequent contributor to the *Entomologist.* As for Prof. Macoun, he is now a naturalist of world-wide reputation, who has been most assiduous in making known the fauna and flora of the Dominion, and although the great demands upon his time do not permit him to continue the study of entomology, he still continues, I am glad to say, the collection of insects as opportunity permits. In the neighboring town of Trenton very careful work has been done by Mr. J. D. Evans, one of the most thorough collectors with whom I have corresponded, and whose collections are models of neatness and skill, in mounting and arrangement.

A branch of the Society formerly existed at Kingston, but I do not find the record of any work except by Mr. R. V. Rogers, from whom we have had several interesting papers. With such a well-known university as Queen's located in the city, there should be more activity in the development of the natural history of the locality. Ottawa in the early days of the Society was the residence of one of our most noted collectors, the late Mr. B. Billings, who was a contributor to Vol. I. His collections were extensive and were very carefully and skillfully prepared, but death cut short his labors, and his collections were mostly destroyed through want of proper care on the part of the Society into whose hands they passed. Of recent years there has been an active, if not large, body of investigators, who have striven to develop a full knowledge of the local fauna, and who have been able to do some useful work in other directions. Prof. Saunders is now there, as Director of the Experimental Farms, in connection with which our good friend, Mr. Fletcher, holds the position of Entomologist and Botanist. The value and authority of his official work, and his enthusiasm in all entomological matters, are recognized by every entomologist. Your out-going President is also to be found in the Capital, when at home, but it would not be quite the correct thing to give any opinion on his work, as you might think me a prejudiced judge. The Ottawa Field-Naturalists' Club, organized in 1879, has always had an Entomological Branch, and several other of its members are doing fair work, among whom I may cite Mr. T. J. MacLaughlin, one of the few collectors of odonata in Canada. Several entomological lists, with numerous reports and papers have been published in the *Transactions* of the Club (now the *Ottawa Naturalist*), and Mr. Fletcher has now ready for publication a complete catalogue of the Ottawa butterflies.

Occasional workers have been stationed at other points, as, for instance, Rev. V. Clementi at North Druro, Mr. N. H. Cowdry at Stratford and Mr. B. Gott at Arkona. In the Lake Superior region the only sustained work has been by Mr. Evans at Sudbury, where he made a most interesting, and fairly complete, collection in several orders. Many rare insects have been captured by him and it is much to be regretted that he has not yet found time to publish the lists which he has had in preparation. Nepigon has several times been visited by Mr. Fletcher, and in one of the annual reports can be found an interesting account of the work done there. Dr. Bethune has also published observations made during a trip to Lakes Huron and Superior.

In the adjoining Province of Quebec we find the work of the Ottawa members naturally extending across the Ottawa river to a country which within a few miles is diversified by outlying spurs of the Laurentians, with some consequent change in the flora and fauna. A strong branch of our society is located in Montreal where much effective work has been done by the resident entomologists. It is only a few years since the branch sustained a great loss in the death of their former President, Mr. Bowles, who had made a study of the lepidoptera of the Island of Montreal, and had written frequent papers on the species collected. Mr. Lyman, who I am glad to see with us to-day, has for several years been the President and has shown great interest in its success, and in the continuance of its meetings. He has made a careful study of the lepidoptera, and has accumulated a splendid collection, while his contributions to the *Entomologist* have been numerous and of unusual interest. The late Mr. Caulfield was an industrious collector, and careful observer, who contributed severable valuable lists and other papers, relating chiefly to the insects of the Island of Montreal. Another member who resided there was the late Mr. W. Couper (also of Quebec and Ottawa) a frequent contributor to our earlier volumes. Among other Montreal workers may be mentioned Messrs Jack, Winn, Hausen, Gibb, Wintle, etc. The Natural History Society has always taken some interest in entomology, and on its annual field-day encourages by suitable prizes the collection of insects by the young people. The *Canadian Naturalist and Geologist* and its successor the *Canadian Record of Science* have from time to time published entomological papers, such as the late Mr. Ritchie's list of local coleoptera, Mr. Caulfield's paper on Canadian orthoptera, and Mr. Hausen's list of coleoptera collected at St. Jerome.

Going down the St. Lawrence we reach Quebec, the scene for many years of the labors of the late Abbe Provancher, whose Faune Entomologique is a monument to his industry and perseverance in the collection and study of our insects, under more than usual difficulties and discouragements. Mr. Bowles and Mr. Hanham also formerly resided in Quebec, and at present we are well represented there by the Rev. T. W. Fyles, a very industrious observer, who has frequently charmed us by the scholarly papers read at these meetings, to be present at which he does not hesitate to take the long journey from the Ancient Capital. The late Mr. Couper made collecting trips to Anticosti and the shores of the Lower St. Lawrence, the results of which appeared in our earlier volumes.

In the Maritime Provinces our only contributors appear to have been Mrs. Caroline E. Heustis of St. John, N.B., and Mr. J. Matthew Jones of Halifax, N.S. The catalogues of the British Museum and other scattered entomological literature show that considerable collections have been made in those provinces, chiefly by officers of the army and navy, and it is matter of regret that there are no resident entomologists, to make a closer study of the insect life, which my own occasional observations prove to be very interesting in many particulars.

Turning westward again to that immense country which stretches from our fair province to the far Pacific, the localities which have been investigated are almost lost in the vast expanse of yet unexplored territory. Mr. Hanham, who formerly collected in Ottawa, Hamilton, Paris and Quebec, has recently removed to Winnipeg, and intends to devote every opportunity to making known its insect life. Capt. Geddes a few years ago made most valuable collecting trips across the prairies and to the Rocky Mountains, and at Laggan, Alta., Mr. Bean is industriously collecting, and adding to our knowledge of the mountain fauna. Both of these gentlemen have, however, devoted themselves chiefly to the study of the lepidoptera, and we have yet to wait for resident entomologists, stationed at moderate distances apart, to gain an adequate idea of the general distribution of the insects of all orders.

On the Pacific coast the Canadian gleaners are also few, although a rich and abundant insect life rewards the labors of the collector. Our chief worker has been the Rev. G. W. Taylor, who has made large collections of lepidoptera, hymenoptera and coleoptera, including many species new to science. These collections were chiefly made in the vicinity of Victoria, V.I., but Mr. Taylor has recently removed to Nanaimo, and has thus a new field of investigation open to him. Mr. W. H. Danby of Victoria is also an energetic collector, and our former associate in the Council, Mr. E. Baynes Reed, now resides at Esquimalt, a few miles from Victoria, and although he has not yet sent to us any account of his work, I know that he is making collections. The recent organization of a Natural History Society in Victoria may stimulate a further interest in Entomology, indeed I believe that a catalogue of the butterflies of Vancouver Island has already been published in the transactions of the Society. Several hundred miles to the north, at Masset in the Queen Charlotte Islands, there is a very careful and competent collector, the Rev. J. H. Keen, who in this farthest outpost has made most interesting discoveries, especially in coleoptera.

A considerable knowledge of the insects of the remoter regions of the Dominion has resulted from the collections made by various members of the staff of the Geological Survey; prominent among whom may be mentioned Dr. Dawson, Dr. Bell and Prof. Macoun. There has not yet been any regular entomological work done in connection with the Survey, and it cannot be expected that the collections of insects, which are made in addition to the regular field work, should be very large or comprehensive. But our thanks are no less due to the gentlemen who have aided; for even a few specimens brought in occasionally, from the distant points reached by these explorers, may do much to help in ascertaining the geographical range and distribution of species. Reference to Volume XXII of the *Entomologist* will show that quite a long and useful list of coleoptera was obtained by collating the various short lists published in the Survey Reports. When the Dominion Museum is housed in correspondence with the value of its great collections, and room is afforded for the display of the natural history specimens collected, the explorers will feel a greater interest in the securing of specimens, and a department of entomology will probably soon be installed.

Having now made a rapid, and necessarily imperfect, survey of the districts which our members have explored in the past, or which they are still investigating, let us change our point of view, and, for a few moments, consider what attention has been bestowed upon the several orders, into which it has pleased systematic entomologists to separate the great and almost inexhaustible complex of minute forms, which are known to us under the general term Insects. From the twenty-five volumes of the *Entomologist*, I have made a list of the papers which seemed to me to be of most importance in helping us to a knowledge of the position of our workers in regard to the investigation of the several orders. The list (appended) is by no means a complete one, as numerous short papers, notes on the occurrence of species, and interesting correspondence have been omitted; my object not being to make an index of papers.

It is found that the contributions dealing with lepidoptera probably equal, in number and volume, those relating to all the remaining groups. This, however, is not surprising, for to this order belong the most beautiful examples of all terrestrial life; flowers of the air, their wings decked with all the hues that blossom or gem can show; as they wing their brilliant flight through the glad summer days, or hover radiantly over the fragrant blooms, they naturally appeal to every heart which is warmed by the least vestige of artistic or poetic taste. Dull and debased indeed in feeling, and most sincerely to be pitied, must he be who sees not some beauty, feels not something of inward pleasure, in beholding these wonderful atoms of grace and brightness.

> "The dreamy butterflies
>   With dazzling colours powdered and soft glooms,
> White, black and crimson stripes, and peacock eyes,
>   Or on chance flowers sit,
> With idle effort plundering one by one,
>   The nectaries of deepest throated blooms"
>
> —*Robert Bridges.*

Apart also from their beauty of form and richness of ornament in the winged state, the lepidoptera furnish the most interesting and attractive examples for the study of the development and life of the insect, from the egg to the imago. In the larval stage they also play a most important part in the economy of nature, and make man pay tribute in varied and large measure. Yet even in this favorite order there remains plenty of work for our entomologists, and far from discouraging those who are engaged in such attractive studies, I would urge them to perfect their knowledge by careful observations on the early stages of our lepidopterous friends and foes, so that they may make their light to shine for the guidance of their fellow students.

Next to the butterflies, the beetles have ever been the favorite prey of the budding entomologist. Very numerous, varied in form and habits, yet easy to collect and preserve, they yield themselves most readily to the formation of an attractive and easily cared for collection. The coleoptera have for these reasons been so thoroughly collected in northern countries, that there remains, even in Canada, a very small percentage of species not already known to entomologists. Even microscopic species from most remote localities, with few exceptions, prove to have received a name and character—even if the character may occasionally not be a good one, or sufficient to qualify the beetle for the position in which it has been placed. Yet there remains abundance of work for our coleopterists in the more careful collecting of the smaller species, and the preparation of accurate local lists, and especially in the study of the early stages of our beetles, since the complete life history of comparatively few species is known.

> "Among the yellow pumpkin blooms, that lean
> Their crumpled rims beneath the heavy heat,
> The striped bees in lazy labor glean
> From bell to bell with golden-feathered feet."
> —*Lampman.*

Of recent years more attention has been directed to the study of the hymenoptera, and interest in these insects has been stimulated by the publication of several fine works. The publication by Cresson of a synopsis of the families and genera, and a catalogue of the described N. A. species has much facilitated the determination and arrangement of collections, but species are being so rapidly discovered and described, that a new edition will soon be necessary to make it conform to the present knowledge of the order. To our younger members, who have not yet settled upon any special line of investigation, I would strongly recommend the consideration of this order, to which my own attention has been chiefly given for several years. The species are very numerous, more so even than the beetles, and the habits of its members are of wonderful variety and interest. From the bees, wasps and ants, with their well developed mental faculties and their highly organized family communities, we pass to microscopical forms of which a score may develop in a single butterfly-egg. The study of these insects is most absorbing, and inexhaustible fields of enquiry are open. It would be very encouraging to see more students attracted to this order; taking up special families, and by sustained and serious researches aiding in the elucidation of many perplexing problems.

> "Mist of grey gnats that cloud the river shore
> Sweet even choruses, that dance and spin
> Soft tangles in the sunset."
> —*Lampman.*

Apart from the three orders to which reference has been made, there has been but a meagre investigation of our insects, notwithstanding their claims to a due share of attention. The diptera are numerous in species and individuals, of much diversity of habit, and of great influence upon the bodily and temporal welfare of man. The order is difficult to study for the very reason that so few have devoted their attention thereto, but it affords scope for much original work, which cannot fail to be of great importance. There are probably hundreds of species now in the collections of our members waiting for some student to make them known to us.

The neuroptera and pseudoneuroptera are less rich in species, but include some of our largest and most striking insects, such as the dragon-flies.

> "To-day I saw the dragon-fly
> Come from the wells where he did lie.
>
> An inner impulse rent the veil
> Of his old husk; from head to tail
> Came out clear plates of sapphire mail.
>
> He dried his wings; like gauze they grew;
> Thro' crofts and pastures wet with dew
> A living flash of light he flew."
> —*Tennyson.*

The early stages of many forms can be advantageously studied in aquaria, for the life histories of but few of the American species have been published. Here is another inviting and almost unoccupied field for students seeking a special line of work.

The same may be said of the orthoptera, our species of which are not numerous, but of moderate size and frequently present in great abundance. They are among the most destructive insect enemies of plant life, but atone, in some measure, for their ravages, by the animation of their movements, and their almost ceaseless stridulation breaking agreeably the silence of the fields.

> "In intervals of dreams I hear
> The cricket from the droughty ground;
> The grasshoppers spin into mine ear
> A small innumerable sound."
> —*Lampman.*

The hemiptera consist of two very large and important groups, which contain many species exceedingly injurious to the crops which man raises, with so much labor, for his sustenance, and even from merely material motives the "bugs" are deserving of careful study. Nor are these insects all unattractive in their forms and habits; many of them, in fact, are very prettily ornamented. It is fully time that some attention was bestowed upon them by our members.

Even yet the avenues of study have not been exhausted; when all the six-footed insects have been examined there still remain for observation the spiders, skilful weavers of the silken films that glisten in the morning dew; the mites, so small and yet so grievously afflicting man and beast and plant; with other allied arthropods of considerable variety of form and habit, which fall within the scope of entomological research.

The volumes of the *Canadian Entomologist* contain many important papers by our numerous and hard-working entomological friends in the United States, upon the orders and groups which have been so much neglected by our own correspondents. These papers indicate the interest and value which is attached to their study, and in these contributions it is often observed that the species under discussion have been derived from Canadian sources. This indicates that our collectors are not working up the material that they obtain with so much care and patient searching. It is certainly easier to send specimens to specialists abroad than it is to determine them with the scanty library and cabinet resources at the command of most of us. But one should not rest satisfied merely with such determinations, but by subsequent study of his insects increase his knowledge regarding them. He will thus be able, at least, to publish correct local lists which may be of great value in the more complete study of the fauna of larger regions, and as data for establishing the distribution of species.

There is a great temptation to amass large collections, which in themselves are very desirable and important, but whose care and incident correspondence and exchange may so engross one's time that profitable lines of investigation are neglected, and one becomes merely an insect curator instead of an entomologist. The finest collection may be suddenly destroyed, or its possessor incapacitated for further labor, and the knowledge which he has accumulated by many years of patient toil is then lost to science, if it has not been published. There are rare instances of writers who seem unable to restrain themselves from any topic, but the majority of entomologists doubtless find, as I do myself, that it is far more pleasant to collect, examine and arrange their specimens than to sit down and write about them. Yet we should try to do our duty in this respect also, knowing that, if we have made discoveries or valuable observations, we owe it to our fellow-workers to make them participants therein through the pages of the *Canadian Entomologist.*

If gentlemen, you have found my paper dry, I may but hope that it has been dry enough to kindle fresh entomological fires, or add fuel to those already existing; fires that shall emit not merely flashes of passing enthusiasm, but which shall burn brightly and steadily, casting light where the shadows now deepen, and by genial warmth stimulating to renewed attack upon the myriad problems which await your solution in the almost limitless and ever-attractive domain of Insect Life.

APPENDIX A.—LIST OF FIFTY CONTRIBUTORS, WITH THE NUMBER OF VOLUMES TO WHICH THEY CONTRIBUTED

	No.		No.
Bean, Thos E., Laggan	2	Hausen, I. F, Montreal	2
Bell, Prof. J. J., Belleville	2	Heustis, Mrs. Caroline E, St. John, N.B.	5
Bell, J. T., "	4	Jack, John G., Chateaugay Basin	5
Bethune, A. M, Port Hope	1	Johnston, James, Hamilton	1
Bethune, Rev. C. J. S., Port Hope	22	Jones, J. Matthew, Halifax	1
Billings B., Ottawa	1	Keen, Rev. J. H, Masset, B.C	1
Bowles, G J., Quebec, Montreal	12	Kilman, A. H., Ridgeway	3
Brodie, W., Toronto	5	Lyman, H. H., Montreal	12
Caulfield, F. B., Montreal	14	Macoun, John, Belleville	1
Clementi, Rev. V., North Douro	4	Moffat, J. Alston, Hamilton	16
Couper, W., Montreal	9	Murray, Wm., "	3
Cowdry, N. H., Stratford	1	Norman, Geo., St. Catharines	2
Croft, Prof. H., Toronto	2	Pearson, C. W., Montreal	3
Danby, Wm., Victoria	2	Pettit, J., Grimsby	5
Dawson, Percy M., Montreal	1	Provancher, Abbe, Cap Rouge	2
Denton, J M., London	1	Reed, E. Baynes, London	13
Evans, J. D, Trenton	1	Rogers, R. V., Kingston	5
Fletcher, J., Ottawa	13	Saunders, H. S., London	1
Fyles, T. W., S. Quebec	12	" Prof. W., "	19
Geddes, Gamble, Toronto	7	" W. E., "	2
Gibb, Lachlan, Montreal	1	Taylor, Rev. G. W., Victoria	4
Gott, B., Arkona	1	White J., Edmonton, Ont	1
Guignard, J. A., Ottawa	2	Williams, J, London	1
Hanham, A. W., Hamilton	2	Winn, A. F., Montreal	2
Harrington, W. H., Ottawa	14	Wintle, Ernest D., Montreal	1

APPENDIX B.—LIST OF CONTRIBUTIONS (NOT COMPLETE) BY THE WRITERS MENTIONED IN APPENDIX A.

Lepidoptera.

	Vol.
Entomological Notes (a series of papers), Saunders	I.
Notes on Canadian Lepidoptera (a series of papers), Bethune	I.
List of Diurnal Lepidoptera observed in the neighborhood of Ottawa, during the season of 1868, Billings	I.
Larva infesting the Parsnip (*Depressaria Ontariella* n. sp), Bethune	II.
On a supposed new Arctian, Saunders	II.
Description of larva of Catocala Polygama, Guen., Reed	II.
Notes on Hadena Xylinoides, Saunders	II.
On the larva of Thecla inorata, G R. Saunders	II.
A new species of Anarta, Bethune	II.
Note on Amphipyra Tragoponis, Bethune	II.
On the larvæ of some Lepidoptera, Saunders	II.
List of Lepidoptera taken at Quebec, Bowles	II.
Accentuated list of Canadian Lepidoptera, Reed	II.
On Neonympha Eurythris, Fab, Saunders	II.
Notes on Lepidopterous Larvæ (series of papers) Saunders	III.
Notes on Samia Columbia, Bowles	III.
Lepidoptera of Anticosti and North Shore of the St. Lawrence, Couper	IV.
Captures of Noctuidæ at St. Catharines, Ont., Norman	VII.
List of Diurnal Lepidoptera of the Island of Montreal, Caulfield	VII.

Coleoptera.

Hymenoptera.

	Vol.
The Grape seed insect, *Isosoma vitis*, n. sp., Saunders	II.
Remarks on the History and Architecture of the Wood Paper-making Wasps, Couper	II.
Notes on the Humble Bees, Bowles	XI.
The Entomology of Vancouver Island. Notes on 80 species of Hymenoptera collected near Victoria, V. I., in 1882, Taylor	XVI.
A new Tenthredinid, Provancher	XVII.
Notes on the occurrence of some species of Uroceridæ, Harrington	XVII.
Additions to North American Hymenoptera, Provancher	XVIII.
Notes on Tenthredinidæ, 1885, Harrington	XVIII.
Notes on Hymenoptera collected near Ottawa, Guignard	XVIII.
Oryssus Sayi, Harrington	XIX.
The Nuptials of Thalessa, Harrington	XIX.
New species of Canadian Tenthredinidæ, Harrington	XXI.
Ibalia maculipennis, Haldeman, Harrington	XXI.
Tenthredinidæ collected at Ottawa, 1889, Harrington	XXII.
Nematus pallidiventris, Fallen—a fresh importation, Fyles	XXIII.
Two new species of Canadian Pimplinæ, Harrington	XXIII.
Canadian Galls and their occupants, Brodie	XXIV.
Notes on Zarea Americana, Fyles	XXIV.
Canadian Hymenoptera (series of papers), Harrington	XXIV.
Typhon flavifrons, n. sp., Fyles	XXV.

Diptera, Hemiptera, Neuroptera and Orthoptera.

	Vol.
List of Neuroptera (collected at Grimsby), Pettit	VI.
List of Canadian Diptera (compiled from Brit. Mus. Catalogue), Couper	IX.
Description of a dipterous parasite of *Phylloxera vastatrix*, Fyles	XIV.
List of Diptera taken in the vicinity of Montreal, Que., Caulfield	XVI.
Notes on Ceresa bubalus, Jack	XVIII.
Notes on Ant-lions, Moffat	XVIII.
List of Orthoptera taken in the vicinity of Montreal, Caulfield	XVIII.

General Papers.

	Vol.
Entomological notes during a trip to the Saguenay, Saunders	I.
Insects of the northern parts of British America compiled from Kirby's Fauna Boreali Americana, Bethune	II.
Quebec Currant Worms, Bowles	III.
Entomological notes during a trip to Lakes Huron and Superior, Bethune	III.
Hints to Fruit Growers (series of papers), Saunders	III.
On some of our Common Insects (a series of papers by Saunders, Bethune, Geddes, Rogers, etc., commenced)	V.
Entomology for Beginners (a series of papers by Saunders, Bethune, Fletcher, Harrington, etc., commenced)	XI.
Entomological notes, Jack	XVII.

A vote of thanks to Mr. Harrington for his valuable and very interesting address was moved by the Rev. Dr. Bethune, who remarked in doing so that he hoped all the members of the Society would be stimulated by the historical record their President had given them to fresh efforts in their investigations and renewed zeal in contributing their observations to the *Canadian Entomologist* and the Annual Report. Mr. Fletcher, in seconding the motion, gave an account of the admirable work that Mr. Harrington has been doing for many years past in collecting and studying the coleoptera and hymenoptera of Ottawa and its neighborhood ; in the latter order especially he had accomplished very much, and described a number of new species. The motion was very cordially received by the meeting, and the vote of thanks was accorded with much acclamation.

The reports of the different sections of the Society were then presented and read by their respective Secretaries

The Treasurer, J A. Balkwill, read the following report of Receipts and Expenditure for the year ending August 31st, 1894 :

Report of the Treasurer.

Receipts, 1893-4.		Expenditure, 1893-4.	
Balance on hand Sept. 1st, 1893	$ 457 54	Printing	$ 631 33
Members' fees	291 08	Report and meeting expenses	157 70
Sales of Entomologist	73 90	Library	82 05
" pins, cork, etc.	62 79	Expense, postage, etc.	116 82
" duplicates	5 25	Rent and fuel	159 97
Government grant	1,000 00	Insurance	28 00
Advertisements	13 50	Salaries	350 00
Interest	14 24	Pins, cork, etc	31 83
		Balance on hand Aug. 31st, 1894.	360 60
Total	$1,918 30	Total	$1,918 30

We, the Auditors of the Entomological Society of Ontario, certify that we have examined the books of the Treasurer, compared them with vouchers, and find them correct, and that the above is a true statement.

John M. Denton,
Jas. H. Bowman, Auditors.

REPORT OF THE MONTREAL BRANCH

Mr. H. H. Lyman read the following report .

Annual Meeting of the Montreal Branch of the Entomological Society of Ontario :

The 21st annual meeting of the Montreal Branch was held at the residence of Mr. H. H. Lyman, 74 McTavish street, on Tuesday evening, May 8th, at 8 o'clock.

Members present, Messrs. H. H. Lyman, President ; J. F. Hausen, W. C. Adams, A. F. Winn. Rev. E. C. Trenholme, a former member was also present.

The President presented the following report of the Council :

21st Annual Report.

The Council beg to present the following report for the year 1893-94 :

From a variety of causes we have had less meetings than usual during the past winter, but the four that were held were well attended, and the following papers have been read :

I.—Common names for butterflies. Shall we have them ? H. H. Lyman.

II.—A Trip to Gomin Swamp, Quebec. H. H. Lyman.

III.—Trypeta solidaginis and its parasites. Rev. T. W. Fyles.

One new member has been added to our roll, Mr. O. C. Hart, but the resignation of Mr. H. B. Cushing has lost us one.

The Council would urge the members to contribute more papers at the meetings, giving accounts of some of their collecting trips, or experience in raising species from the egg or larva as well as to bring more specimens with them.

The present season has opened unusually early, and there seems to be a prospect of a particularly good year for insects, and it is hoped that a lot of good work will be done by our entomologists.

The Treasurer's report showed the balance at our credit to be growing slowly.

Respectfully submitted on behalf of the Council.

(Signed), H. H. LYMAN,
President.

The following officers were elected for the ensuing year :

President—H. H. LYMAN.

Vice-President—LACHLAN GIBB.

Secretary-Treasurer—W. C. ADAM.

Council—J. F. HAUSEN, A. F. WINN.

Mr. Winn read a paper entitled " An Hour at Hochelaga," illustrated by the specimens taken.

The meeting then adjourned.

A. F. WINN,
Secretary.

REPORT OF THE GEOLOGICAL SECTION.

Mr. President and Members :

I regret that the chairman of our section for the past year is not with us to-night. I refer to the Rev. Chas. Andras, who, you will remember, was with us a year ago at our last annual meeting, but has now gone to reside in the North West. We expected with his assistance to have presented a full and comprehensive report of the proceedings of our Society for the past season. We have had no more active member in our section than he since its organization. All his spare moments were devoted to making a collection of the minerals and fossils of this region, most of which were exhibited to the class from time to time, adding very much to the interest as well as profit, and giving us some idea of what might be obtained at our own doors. He made a very large private collection during the time he was with us. Together we visited most of the outlying towns in search of specimens for our cabinets, and have travelled on foot many a mile in these holiday outings.

Among other places we have visited St. Marys, Dorchester, Kilworth, Byron, Komoka, Kettle Point (Lake Huron), Ilderton, Thedford, Beachville and Woodstock.

Occasionally we had some of our fellow workers to bear us company and assist in our undertakings and researches.

I can only mention a few of my observations along the geological line. The work undertaken by this section has been greater and more successful than in any previous year, not only as regards the material that has been collected, but also in the interest the members have shown by regular attendance at our weekly meetings, and taking an active part in the discussions that have arisen from the objects laid before them.

We have also been favored with several interesting lectures and papers on various geological subjects as follows :

By the Rev. Prof. Andras :

I.—Earthquakes.

II.—Talk on British Coal Fields.

III.—Sketches of his North West Travels.

By Prof. J. H. Andras :

I.—Papers on Cephalapoda.

II.— " " Arcidae.

By Dr. I. G. Wilson :

I.—Paper on Silica.

II.— " " Glacial Drift.

By Mr. I. Goodburn :

I.—Lecture on the Six Days' Work of Creation.

By. S. Woolverton :

I.—Paper on Trilobites.

It is proposed to print some of them for circulation, or if thought worthy in the Journal of this society. Several of these addresses were given at the home of the vice-chairman, where an available collection is to be found, the better to illustrate the subject of the lecture.

Another observation perhaps worthy of mention, is the finding of a great number of Indian relics in this vicinity during the past summer. A number of mounds have been dug over and many rare specimens have been obtained of the North American Indian, notably—skinning-stones, pipes, bone needles, bones of the animals eaten by early inhabitants, in a perfect state of preservation, with pottery in great abundance.

The remains were all found in ash heaps, kitchen middens so called, showing conclusively that this was once a favorite resort and hunting-ground of a race of people that have faded away over three hundred years ago.

From this source sufficient material has already been collected to stock a department in a public museum.

S. Woolverton,
Vice-Chairman.

REPORT OF THE BOTANICAL SECTION OF THE ENTOMOLOGICAL SOCIETY.

The Botanical Section beg to offer the following report for the summer of 1894.

The first meeting was held on April 21st, and from that date until September 24th regular meetings were held, except for a part of August.

At all the meetings the attendance has been fair, and a number of young business and professional men have become enthusiastic workers. The principal work undertaken was the collection, identification and recording of the phaenogamous plants of this district.

Field days in various directions were very fruitful, especially to Komoka on May 24th, when 77 species of plants were identified, all in bloom. At Mud Lake, south of Dorchester station, the beautiful and extremely sweet-scented *Habenaria blephariglottis* was found abundant on July 2nd.

Probably the most important collections of the season were : *Collinsia verna*, taken by Mr. Robert Elliott near Plover Mills, London township, Middlesex, May 26th, now first recorded in Canada ; and *Utricularia resupinata*, collected by Mr. J. H. Bowman, near Bala, Muskoka, not before identified and recorded to our knowledge.

A specimen of the notorious Russian Thistle was found by Mr. Dearness, near Tilbury Centre in Kent county.

All of which is respectfully submitted.

W. F. McClement,
Secretary.

REPORT FROM THE ENTOMOLOGICAL SOCIETY TO THE ROYAL SOCIETY OF CANADA.

By Rev. Thomas W. Fyles, F. L. S., Delegate.

I have the honor to report that the Entomological Society of Ontario continues, with zeal and success, its researches into all such subjects as naturally fall under, or in any way have a bearing upon Scientific and Economic Entomology.

The membership of the Society during the past year has greatly increased, especially by additions from the Province of Ontario. This fact betokens both a growing interest in the subject of entomology, and also an increasing confidence in the Society as a guide and helper in its pursuit.

The Society was established in 1863. Of its founders but few now remain; most of them have been lost to us through death, or departure to distant places of residence. By the members of the present day their memory is held in grateful respect. The Society, however, still enjoys the benefit of the experience and scholarship of the Rev. C. J. S. Bethune, and the business talent of Mr. J. M. Denton The names of these gentlemen appeared in the first list of officers published by the Society, and they are found also in the list published for the present year.

The Society enjoys the confidence of the many able entomologists who have been appointed to positions in the colleges and experimental stations of the United States of America; and numerous articles from these gentlemen have appeared in the Society's publications. It also numbers among its correspondents leading entomologists in England and Germany.

It is largely due to the wise and liberal support of the Ontario Government that the Society has been enabled to attain its present eminent position of usefulness.

The report of Mr. J. A. Balkwill, Treasurer of the Society, shows that its finances are in a highly satisfactory state—all expenses having been met, important purchases for increasing the advantages of the Society having been made, and a sufficient balance remaining for carrying on the immediate work of the Society.

Seventy volumes have been added to the Society's library in the course of the year, by donation and purchase. Among them are: the "Tenth Volume of the Proceedings and Transactions of the Royal Society of Canada," "The Report of the Ontario Game and Fish Commission," "The Report of the Smithsonian Institution," "The Report of the New York State Museum," "The Mammals of Minnesota," "The Hawks and Owls of the United States," "The Seventeenth Report of the Geology and Natural History of Indiana." The number of books in the library is now 1,284. Very important additions have also been made to the Society's collections of natural objects.

Valuable work has been done by the Ornithological, the Botanical, the Microscopical and the Geological Sections of the Society, and a report from each of them was read at the annual meeting. With a view to bringing the knowledge and experience of the members of these sections to bear more frequently for the good of the Society at large, a Committee on Field Days, consisting of Dr. Woolverton, Messrs. McClement, Elliott and Stevenson, and one representative from each section, was appointed at the annual meeting.

The Montreal Branch of the Society held eight meetings during the year, at which interesting papers were read, and much profitable conversation upon entomological subjects generally was held. The branch numbers among its members men well acquainted with the entomology of the Montreal Island: Messrs. L. Gibb, A. F. Winn, F. Hausen and H. B. Cushing; and the hospitality of Mr. H. H. Lyman, the president of the branch, and the access he has afforded to his extensive collections of lepidoptera have made the meetings of the branch exceedingly pleasant and profitable.

The Annual Report of the Society, printed by order of the Legislative Assembly of Ontario, contains: a record of the proceedings of the annual meeting held October 11th and 12th; reports from the council and the various officers and sections of the Society; the opening address of Mr. James Fletcher (given in the absence of the president), and telling of the injurious insects of the year and the various modes of dealing with them; and the annual address of the president, Mr. W. Hague Harrington, likewise containing much valuable information on these subjects. These are followed by contributions from members of the Society, viz.:

"The Entomological Mistakes of Authors," by Rev. Thomas W. Fyles, South Quebec.

"The Season of 1893," by the same.

"Mosquitoes," by J. Alston Moffatt, London, Ont.

"Canadian Uroceridæ," by W. Hague Harrington, Ottawa.

"Additional Notes on Japanese Insects," by the same.

"Notes and Queries," by Rev. W. J. Holland, Ph.D., Allegheny, Pa.

"The Dragon Fly," by T. J. MacLaughlin, Ottawa.

"The Song of Thyreonotus," by William T. Davis, Staten Island, N.Y.

"Notes on some of the more important Entomological Exhibits at the Chicago Exhibition," by James Fletcher, Ottawa.

Then comes a full report of the annual meeting of the Association of Economic Entomologists, furnished by Mr. L. O. Howard, of the Division of Entomology, Department of Agriculture, Washington, D.C., together with some of the most generally interesting papers read at the meeting. Some of these are by the most eminent and practical entomologists of the United States, and all of them are valuable. The closing pages of the report are devoted to book notices, obituaries, etc.

The *Canadian Entomologist*, the Society's monthly organ, completed at the end of the year its 25th volume. This volume contains descriptions of no less than 162 new species of insects. The contributors to its pages number 56. Among them are men of world-wide reputation.

That the Society may be of service to the community at large, by teaching our farmers, gardeners and fruit growers the life histories of their insect friends and insect foes, and by showing them how the injurious attacks of the latter are carried on, and what steps should be taken to meet and nullify them is, we believe, the earnest desire of every one of its numerous members.

Appended will be found a list of the officers of the Society.

The whole is respectfully submitted.

THOMAS W. FYLES, F.L.S., Delegate.

ELECTION OF OFFICERS.

The following gentlemen were elected officers for the ensuing year:

President—W. HAGUE HARRINGTON, F.R.S.C., Ottawa.

Vice-President—J. DEARNESS, London.

Secretary—W. E. SAUNDERS, London.

Treasurer—J. A. BALKWILL, London.

Directors—Division 1, JAMES FLETCHER, F.L.S., F.R.S.C., Ottawa.

Division 2, REV. C. J. S. BETHUNE, F.R.S.C., Port Hope.

Division 3, GAMBLE GEDDES, Toronto.

Division 4, A. H. KILMAN, Ridgeway.

Division 5, R. W. RENNIE, London.

Librarian and Curator—J. ALSTON MOFFAT, London.

Editor of the "Canadian Entomologist"—REV. C. J. S. BETHUNE, M.A., D.C.L., Port Hope.

Editing Committee—J. FLETCHER, Ottawa ; H. H. LYMAN, Montreal ; REV. T. W. FYLES, South Quebec ; J. M. DENTON and J. H. BOWMAN, London.

Delegate to the Royal Society—REV. T. W. FYLES, South Quebec.

Committee on Field Days—DR. WOOLVERTON, Messrs. MCGLEMENT, ELLIOTT and STEVENSON, London.

Auditors—J. H. BOWMAN and J. M. DENTON, London.

Dr. Woolverton exhibited a very perfect and beautiful trilobite, *Phacops bufo*, from the Devonian rocks in the neighborhood, and made some interesting remarks upon the geology of the district.

Mr. Bowman made a verbal report upon the proceedings of the Microscopical Section during the past season.

Mr. W. Scarrow suggested that the Council should be instructed to find more suitable quarters for the Society, as the present room was entirely inadequate for the purpose. The matter was discussed at some length by several of the members, and it was finally decided that the officers of the Society resident in London should be empowered to look for satisfactory accommodation, and take whatever steps might be necessary to secure it.

A very entertaining and interesting paper was then read by the Rev. T. W. Fyles on "Food, Feeders and Fed," which was highly appreciated by the audience.

The meeting adjourned at 10.30 p.m.

THURSDAY, NOVEMBER 8TH.

MORNING SESSION.

The meeting was called to order by the President at 10 o'clock a.m.

The first paper read was by Mr. H. A. Stevenson describing an attack by the moth, *Ephestia interpunctella*, in a warehouse in London, and the successful manner in which it had been dealt with.

Dr. Bethune then read an interesting paper on "The Economic Value of Parasitism," by Prof. F. M. Webster, of Wooster, Ohio. Mr. Harrington, in commenting on the paper, stated that the canker worms which had been so injuriously abundant about Ottawa for two or three years, were this season almost exterminated by their parasites.

Mr. Moffat presented papers on "A re-appearance of Pieris Protodice," and "Remarks on the Structure of the Undeveloped Wings of the Saturniadæ."

A paper by Prof. L R. Jones, of the Agricultural Experiment Station at Burlington, Vermont, on "Bordeaux Mixture as a Deterrent Against Flea-beetles," was presented by Mr. Fletcher.

[All the papers read at the different sessions are printed *in extenso* in the following pages of this Report.]

Resolutions regarding the binding of periodicals and the case of members in arrears with their subscriptions, were brought forward and discussed, and action taken upon them.

The remainder of the morning was spent in examining and determining specimens which had been brought to the meeting by various members. At twelve o'clock the proceedings were brought to a close, all who had taken part in them having much enjoyed their annual gathering and the many interesting papers brought before them.

INSECTS COLLECTED IN BERMUDA DURING THE WINTER OF 1894.

By Gamble Geddes, Toronto.

The paper I propose to read before the members of the Society, will not, I fear, treat especially upon insects, for I have experienced great difficulty in securing the names of many of the species captured by me in Bermuda during the four months of last winter beginning in January. I can, however, place a number of examples before you for inspection, which may prove interesting in that they correspond so closely to many of our Canadian insects.

I shall, in the course of the paper, touch upon a few of the food-plants which came under my notice and read a list of the insects named in the only book that I could find on the subject in the Public Library. This list will not, I can assure you, occupy much of your time, as it was published thirty years ago, and very little collecting has been done since.

In considering the diurnal lepidoptera of the Islands, I shall begin first with *Danais Archippus*, which species was flying about freely in February and March. I fancy it must be an all-the-year-round insect as I took eggs and larvæ upon a lovely asclepias (*A. Curassavica*) at the same time that I captured apparently perfect imagos.

Of this asclepias I have raised from seed several healthy plants, and was in hopes that I could produce one in bloom.

Mr Oswald A. Reade, (now a pharmaceutical chemist in London, England), has made his mark as a botanist in Bermuda and elsewhere, and has written a book entitled, "Plants of Bermuda, or Somer's Islands."

In his description of this asclepias (or Butterfly weed) he states that it is a perennial plant, growing from two to four feet high, half shrubby at the base, the stems being cylindrical and downy. The pods are ovate, smooth and seeds embedded in glossy, silky hairs. Distribution, West Indies. Habitat, waste places. He also says flowers showy, scarlet and orange, frequent, July to November.

I presume when he states those particular months he means that these plants are in their "prime" at this time of the year, for I found full grown larvæ, and also, very diminutive larvæ, also eggs, upon asclepias during the months of February and March.

I did not find any of the larvæ on the other asclepias, viz., *A. Linaria.*

The commonest and only other diurnal I captured was *Junonia Cœnia*, and the larvæ of this insect fed freely upon the leaves of the common sage bush, (*Lantana Odorata.*) This shrub forms the principal undergrowth of all the Islands from one end to the other of the group. It has been grown to great perfection in many of our hothouses.

J. Cœnia in its flight reminds me very much of the Vanessidæ and is quite difficult to catch on a sunny day, but easy to net in damp and foggy weather.

These two species are the only ones taken in winter, but a list was printed in "The Naturalist in Bermuda," by Jno. Matthew Jones and Major Wedderburn, (late 42nd Highlanders) and J. L. Hurdis, Esq., in 1863—thirty-one years ago—which reads as follows :

Danais Archippus.................... Food plant, asclepias, common.
do. Berenice.......................... do. rare.
Vanessa Atalanta.................... April to November.
Cynthia Cardui....................... Early November, abundant 1852.
Vanessa Antiopa..................... Rare.
Junonia Cœnia....................... Called Musk Butterfly, common.
Terias Lisa............................ September, October and November.
Unknown (1853, September).......... Brimstone yellow, tinged with a greenish hue large as English Brimstone Butterfly, taken on potato patches.

These eight varieties of butterflies appear to be all known at that time whilst none of the Skippers or Lycænidæ appear to have been captured. This seems a curious fact as it is well known that both families are abundantly represented in the southern States and in all the West Indian Islands.

Sphinx (*Phlegethontius*) *Cingulata* is very common in season, the larva is taken on the Papaw (*Asiminia Triloba*) has a thick caudal horn and pupates in the ground as most of the Sphingidæ do. (See Grote's check list of the Hawk moths of North America.)

The other Sphinx taken by myself was *Chærocampa* (*Deilonche*, Grote) *Tersa.* Larva feeds on Button-weed (*Spermacoce Glabra.*) Mr. Grote, in his remarks upon this insect says, rare in Canada and Eastern States, more common in the south ; it has at least two congeners : *Deilonche Robinsonii* (Grote) in Cuba, and *D. Falco* (Walker) in Mexico ; comparative studies must be made with other forms referred by Butler to Chærocampa, a genus with European types.

I was also informed in Bermuda that *D. Lineata* had been taken, but I saw no traces of it in the few collections I came across, nor did I take a specimen myself.

I now come to the most interesting part of the collection I made, viz.: the various families of moths outside of the Sphingidæ. I am indebted to Mr. Moffat for his kindness in naming a few that are identical with the Canadian species. I was unfortunate in not meeting Mr. Neumogen, of New York, on my way back, as in these matters he has always been most willing to assist me.

I am not aware of seeing any specimens in the following families, viz.: Ægeriadæ, Thyridæ, Zygænidæ, Bombycidæ; but of Noctuidæ, Geometridæ, Pyralidæ and Tortridicæ there is evidently a large field open for collectors even in the winter months. In the Noctuidae the Drasterias and Plusias largely predominate and the undetermined species which I have with me will clearly indicate what a wealth of them exists on these islands.

I shall endeavor to get a correct list of all the Noctuids, as well as the other groups, and give a list of those which have occurred in Canada, that are identical with the Bermudian insects. This list I should be pleased to have published in the "Entomologist" for future reference by those who may be interested.

In Pyralidæ I have taken in numbers, *Eudioptis hyalinata* of Linneus, *Nomophila noctuella*, *Botis adipaloides* and many others not yet identified.

The majority of these moths have been taken in the bright sunshine, mostly during the time of day known in Bermuda as "between the showers" and rarely at dusk.

The favorite flower of the Plusias was *Sinapis nigra* in appearance like a white mustard flower ; also a species of Golden Rod, (*Solidago sempervirens.*)

I have also taken a number of Pyralidæ on the common "Sowthistle," (*Sonchus Oloraceus*) and a few Coleoptera on the same plant.

A few of the micros appeared to gather their food from a beautiful little plant resembling a dicentra, viz : *Fumaria Densiflora* ; and *Parthenium Hysterophorus*, a bunch aster, was full of all kinds of insects.

Upon the vetch (*Vicia Saliva* I think) I took numerous Hymenoptera, notably the Bermuda wasp, *Polistes pallipes.*

Upon the flower of the orange Lantana, (*L. Crocea,*) most of the Diptera were caught, and this lovely shrub grows everywhere, so freely that one was seldom at a loss to look for a bush of it.

Coleoptera. Very few Coleoptera are known in Bermuda, as far as I can ascertain, my total catch for over three months being 15 specimens—6 of which evidently are one species taken from the centre of full-blown roses.

Of Diptera I took about 50 specimens, including our own pet housefly. This was by no means uncommon during winter as the domestics had to drive them out of the rooms two or three times a day in fine weather and keep the house quite dark. Another favorite, (the musquito,) was only too common, and for variety in size and the nature of its bite, I consider them unequalled. These unwelcome intruders kept me so continually busy in looking after my own interests that I came to the conclusion I would not study their food plants—nor would I recommend them to any of my Bermudian friends as a "benefical insect" (to mankind at least.)

Of Hemiptera about 6 varieties were captured, principally about the Loquat tree and upon the tree known as The Pride of India.

The Loquat is a favorite fruit with not only the natives but nearly every visitor who tastes it. The botanical name is *Cydonia Japonica,* and as its name implies is a native of Japan, and thrives in sheltered places.

The Pride of India. (*Melia Azedarach*) is a grand tree and lines the boulevards of the principal streets in Hamilton. I have water-color sketches of these trees, one in fruit the other in flower.

There is one other fruit tree the product of which seems most palatable to the natives, viz.: The Surinam Cherry. I am at fault about the scientific name, but also produce a water-color sketch of the fruit at its best. Upon the blossoms the Plusiadæ and bees are to be taken, frequently in February and March. I have no doubt in the summer months the second crop would attract many more examples, for the trees fruit twice a year, I have been told by old residents.

Referring to this tree I have taken a few katydids and grasshoppers, (Orthoptera,) amongst them doubtless *Conocephalus Ensiger,* although I must confess I prefer the song of his green colored cousin *Phylloptera Oblongifolia,* hailing from our midst and which is found drowned so often on the shores of our lakes in Upper Canada after a heavy gale of wind.

The spiders would give entertainment to any enthusiast for months, for their name is legion.

In conclusion I may add that the Neuroptera were very scarce during the winter-time, although I saw several varieties in some of the local collections which were unnamed. Evidently they were abundant about the marshes during the summer months.

COMMON NAMES FOR BUTTERFLIES.—SHALL WE HAVE THEM?

By H. H. Lyman, Montreal.

Read before the Montreal Branch 14th November, 1893.

This is a question upon which the entomologists of this continent have been as much divided as upon any of the deeper scientific problems which have engaged their attention.

The great majority of the working entomologists have been strongly opposed to their introduction, some even fiercely so, but there have been a few entomologists, some of them of the first rank, who have espoused their cause with at least some measure of success.

Of course there are many objections to these names, the chief being their purely arbitrary and unscientific application, the impossibility of securing uniformity in their use and the difficnlty of obtaining suitable and sufficiently concise names for more than a very limited fauna

The opponents of popular names assert that it should be as easy to remember the scientific as the common names and that if it is not, we should not encourage laziness by adopting them.

I used to be as strongly opposed to these names as anyone, but latterly have sometimes thought that if their adoption would result in popularizing the study of this science the gain would be worth the sacrifice.

In this paper, therefore, I propose to discuss this subject which has recently been brought again into view by Mrs. Slosson's interesting paper in the first number of the journal of the New York Entomological Society, and shall try to do so in a calm and judicial manner. Of course Mrs. Slosson would not suggest that the names which commend themselves to her proteges should be generally adopted, but why should we not have common names scientifically applied ?

It is all very well to say that it should be as easy to remember the scientific as the popular name, but it isn't. It ought to be, of course, just as it ought to be just as easy for children to be good as to be naughty.

I have often been asked the name of a moth and when I had given it, it has been greeted with a laugh of derision, for the general public scoff at these scientific names, and one doesn't wonder when one looks over a catalogue and sees the terrible names, such as nezahualcoyotl, which have been given to beautiful and inoffensive creatures.

It does not degrade Botany to have the Cypripedium called the Lady's Slipper, the Ranunculus the Buttercup, or Lonicera the Honeysuckle, nor does Ornithology suffer because Hirundo Horreorum is better known as the Barn Swallow, and Tyrannus Carolinensis as the Kingbird, and why should there be an outcry at calling the lovely Idalia the Regal Fritillary, or Grapta Gracilis the Hoary Comma ?

I believe that if we could have common names for our butterflies and a cheap, but good, book with a recognizable colored illustration of each species, such as England has in Coleman's British Butterflies, we should have at least ten persons interested in entomology for every one that we have to day.

If it be urged that it is impossible to secure absolute uniformity in the use of these names the same is true of the scientific names, as we all have to remember in reading Mr. Scudder's works that what he calls Jasoniades Glaucus is what the rest of us call Papilio Turnus.

It seems to me that one of the chief objections to the adoption of these popular names is their arbitrary application totally regardless of scientific relationship. For instance, they have in England two butterflies, known respectively as the White Admiral and the Red Admiral. Naturally one would suppose that these belonged to the same genus, instead of which they belong to entirely distinct genera, which in Kirby's world-wide catalogue are separated by fifty-seven other genera, while on the other hand the nearest ally in England of the Red Admiral is called the Painted Lady, which is surely an opprobrious name.

When I began collecting as a child, upwards of thirty years ago, and wanted to know the names of my treasures, I was told that Cardui was the Thistle butterfly. Shortly afterwards I captured a specimen of Atalanta, and fairly gloating over the pre-eminent beauty of its under surface I named it the Queen Thistle, for child though I was, I at once recognized its close relationship to the other. But in the common names which have been proposed by various authors, the generic relationship has frequently been lost sight of. A very marked example of this occurs among Scudder's names in two cases adopted from Gosse, for some of the Pierinæ ; thus Eubule is the Cloudless Sulphur ; Philodice is the Clouded Sulphur ; Lisa is the Little Sulphur. Then in the genus Argynnis, Atlantis is the Mountain Silver Spot while Aphrodite is the Silver Spot Fritillary, the latter certainly a most indefinite name considering the number of silver spot fritillaries we have on this continent. On the other hand some of Gosse's names were so well chosen that we can recognize the species intended even when linked to wrong scientific names. This is strikingly the case in the Graptas, for which his names were particularly appropriate and have in all but one case been adopted by Scudder.

The Violet Tip was his name for Interrogationis ; the Green Comma, though doubtfully linked with the name Progne, must have been intended for Faunus, not at that time described, while the Orange Comma and the Gray Comma well indicate G. Comma and G. Progne. It is doubtless true that in English works the popular name is frequently given undue prominence, being printed in large type at the beginning of a description, while the scientific name is given in italics, or in brackets at the end of the description, and the same prominence was, I found, given to popular names in the beautiful economic exhibit from the Entomological Division of the Department of Agriculture in the U. S. Government building at the World's Fair; but it is not necessary to follow this custom, and we could very well print the scientific name first in large type and the popular name second in smaller type as is done by Mr. Scudder in his "Butterflies of New England."

But if it be agreed that the adoption of popular names is on the whole desirable, is it practicable? No doubt it is for a limited fauna like that of England or New England, but is it for the whole of North America?

Who will undertake to invent suitable popular names for the upwards of sixty species of Argynnis, the nearly forty species of Melitæa, the fifty species of Thecla, the equal number of species of Lycaena, or the upwards of ninety species now grouped under the generic name Pamphila?

I confess the idea appears to me utterly hopeless and impracticable.

THE BUTTERFLIES OF THE EASTERN PROVINCES OF CANADA.

BY REV. C. J. S. BETHUNE, PORT HOPE, ONTARIO.

The following list of the butterflies of the Eastern Provinces of Canada has been prepared in order to bring together in convenient form all the localities that have been published as well as those that have come under my own observation. The list is as complete as I can at present make it, but no doubt there are many collectors in different parts of the country who could add largely to the localities given, and possibly add a few more species to those here recorded. The time of flight and the food-plants are given in most instances.

The question of nomenclature and arrangement has been a difficult one to decide. It will be observed that I have followed the order of families and genera given in Dr. J. B. Smith's "List of Lepidoptera of Boreal America," (Philadelphia, 1891), and have for the most part adopted the nomenclature of Mr. W. H. Edwards's "Revised Catalogue of the Diurnal Lepidoptera of America North of Mexico," (Philadelphia, 1884). For the sake of convenience I have added in brackets Mr. Scudder's name for the species whenever it differs from that which I have employed. I have also followed Mr. Edwards in beginning the specific names with a capital letter as they are nearly all proper names and seldom adjectives.

In the preparation of this list the records of the following authors and observers have been gone over for localities in the Province of Ontario: Messrs. D. W. Beadle, St. Catharines; J. M. Denton, London; J. D. Evans, Sudbury; G. Geddes, Toronto; Rev. W. Kirby, ("Fauna Boreali-Americana: Insecta"); Theodore L. Mead, Oviedo, Florida; Prof. J. Macoun Geological Survey of Canada, Ottawa; J. Alston Moffat, London; J. Pettit, Grimsby; E. Baynes Reed, London. For both the provinces of Ontario and Quebec: Messrs. B. Billings, Ottawa: W. H. Edwards ("Butterflies of North America, etc.); J. Fletcher, Ottawa; Prof. W. Saunders, Ottawa; S. H. Scudder ("Butterflies of the New England States and Canada"). For the Province of Quebec alone: Dr. R. Bell, Geological Survey of Canada, Ottawa; J. G. Bowles, Montreal; F. B. Caulfield, Montreal; W. Couper, Montreal; W. S M. D'Urban, Montreal; Rev. T. W. Fyles, South Quebec; P. H. Gosse, Compton, ("Canadian Naturalist"); J. G. Jack, Chateauguay Basin; H. H. Lyman, Montreal; A. F. Winn, Montreal. For Nova Scotia and New Brunswick: Mrs Heustis, St. John; J. Matthew Jones, Halifax. For Newfoundland: Capt. Brown and Mr. P. H. Gosse. For Labrador and Hudson Strait: W. Couper and Lieut. Payne. For Prince Edward Island: Prof. John Macoun.

LEPIDOPTERA.

RHOPALOCERA.

Family NYMPHALIDÆ.

Sub-family *Euploeinæ*.

1. DANAIS ARCHIPPUS, *Fabr.* (*Anosia plexippus*). Abundant throughout Southern and Eastern Ontario; taken also on the shores of Georgian bay, at Sault Ste. Marie and Nepigon; rare in the Province of Quebec, taken at Montreal, Sorel, Quebec, River Rouge district, Little Metis; rare in Nova Scotia. Earliest dates, May 24, June 4, 6, 7, 12, 14; very common in July; especially abundant in August and September; latest dates, October 23, 27. Food plant, Asclepias. Fig. 1, represents the butterfly; Fig. 2, the caterpillar; Fig. 3, the successive changes to chrysalis; Fig. 4, the chrysalis.

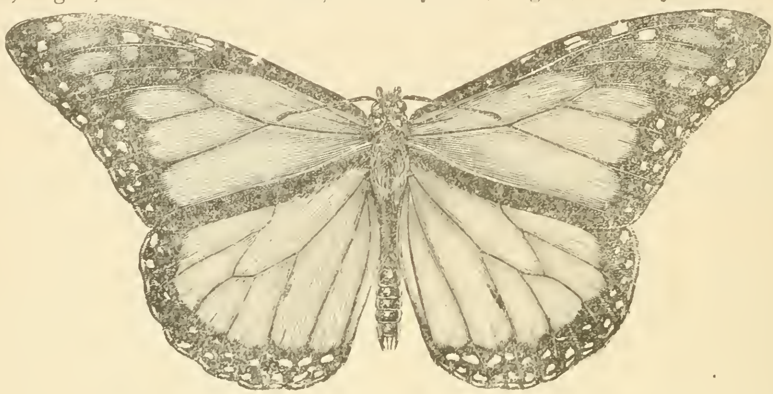

Fig. 1.

Fig. 2.

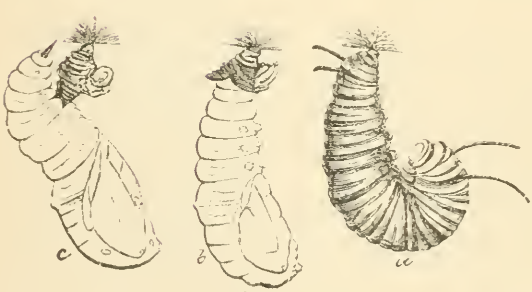

Fig. 3.

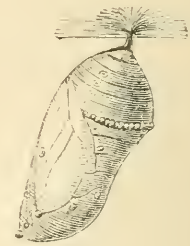

Fig. 4.

Sub-family *Nymphalinæ*.

2. EUPTOIETA CLAUDIA, *Cram.* Very rare. Has been taken at Wabigoon, Ont. (J. C. Guillim), London, St. Catharines, Chateauguay Basin, Montreal (Aug. 15, 1874) also in Manitoba and North-West Territories. Food plants—Violet, Passion Flower, Sedum, Portulaca, Desmodium, Podophyllum.

3. Argynnis Cybele, *Fabr.* Common throughout Ontario and Quebec. Taken at Nepigon, Sault Ste. Marie, Georgian bay, Cameron lake. Amherstburg, Point Pelee, London, West Flamboro', Hamilton, Credit, Toronto, Port Hope, Cobourg, Ottawa; Montreal, Eastern Townships, Quebec, Little Metis; also in Cape Breton and Prince Edward Island. Flies during July, August and September. Food plant of this and the other species of Argynnis is the various species of Violets.

4. Argynnis Aphrodite, *Fabr.* Taken throughout Ontario and Quebec. Nepigon, Sault Ste. Marie, north of Lake Huron, Sudbury, Cameron lake, London, Hamilton, West Flamboro', Credit, Toronto, Cobourg, Ottawa; Montreal, Sorel, Quebec, Lower St. Lawrence and Bay of Chaleur; Restigouche river, New Brunswick; Nova Scotia; Prince Edward Island; Moose Factory, James's bay. Flies during July and August.

5. Argynnis Atlantis, *Edw.* Common throughout Northern Ontario and Eastern Quebec. Moose Factory, Nepigon, Fort William, Sault Ste. Marie, Ottawa (rare); Montreal (very rare), Co. Missisquoi, P. Q., Little Metis, Godbout river, Cacouna, Lower St. Lawrence; Anticosti, Labrador, New Brunswick, Nova Scotia, Cape Breton, Newfoundland, Prince Edward Island. Flies during July and August.

6. Argynnis Electa, *Edw.* Nepigon (Macoun, Fletcher, Bethune).

7. Argynnis Cipris, *Edw.* Nepigon (Bethune and Fletcher). Sudbury (Fletcher and Evans), August.

8. Argynnis Myrina, *Cram.* *(Brenthis Myrina).* Common throughout the eastern Provinces of Canada. Nepigon, Fort William, Sault Ste. Marie, Sudbury, London, Hamilton, St. Catharines, Grimsby, Credit, Toronto, Cobourg, Rice lake, Ottawa; Montreal, River Rouge district, Eastern Townships, Quebec, Cacouna, Little Metis, Godbout river, Lower St. Lawrence; Metapedia river, Dalhousie, N.B., Nova Scotia, Cape Breton, Prince Edward Island. Flies during June, July and August. Taken at Montreal in May and at Ottawa in September.

9. Argynnis Chariclea, *Ochs.* (*Brenthis Chariclea*). Port Arthur, Spanish river, Nepigon, Georgian bay (Lyman), July. Labrador, May 30 and June (Couper). Mingan, July 22. Hudson bay.

10. Argynnis Freija, *Thunb.* (*Brenthis Freija*). Port Arthur, Fort William; Quebec, Gomin Swamp; Labrador, Hudson's straits, Cumberland House, Lat. 54° (Kirby), taken in August and September.

11. Argynnis Bellona, *Fabr.* (*Brenthis Bellona*). Common in Ontario and Quebec. Nepigon, Fort William, Sudbury, London, Credit, Hamilton, Cobourg, Ottawa Lake Temiscamingue, P. Q, Chateauguay Basin, River Rouge district, Quebec, Little Metis, Godbout river, Lower St. Lawrence, Dalhousie, N B., Moose Factory. Flies in June, July, and August.

12. Argynnis Triclaris, *Hubn.* Ottawa, Mer Bleue (June 16, 1893); Labrador (Couper, Low).

13. Melitæa Phaeton, *Drury.* *(Euphydryas Phaeton).* Widely distributed, but rarely seen. Flies only about swamps and the damp margins of rivers. Has been taken at Ottawa, London, Toronto, Montreal, Quebec, Nova Scotia, New Brunswick. Flies during the latter part of June and first half of July. Food plants—Chelone glabra, Lonicera and Viburnum.

14. Melitæa Harrisii, *Scud.* (*Cinclidia Harrisii*). Very rare, though widely distributed. Sudbury, Montreal, Quebec, St. Henri, Levis, Saguenay, Gaspé; New Brunswick, Nova Scotia, Newfoundland. Taken at the end of June and up to the middle of July. Food plants—Double-bristled Aster, Diplopappus umbellatus.

15. Phyciodes Nycteis, *Doubl-Hew.* (*Charidryas Nycteis*). Taken throughout Ontario and in Quebec; not common. Nepigon, Port Arthur, Sault Ste. Marie, Sudbury, London, Hamilton, Toronto, Ottawa; Montreal, Quebec, Saguenay. Flies in June and July. Food plants—Helianthus (Sunflower), Actinomeris.

16. PHYCIODES CARLOTA, *Reak.* Very rare. Taken at London, (Saunders), Scarborough near Toronto, (Geddes); Nova Scotia, (Jones) "South of Lat. 40° from Atlantic to Rocky Mountains," Scudder.

17. PHYCIODES BATESII, *Reak.* Only recorded from Hamilton (Johnson) and Godbout river, P. Q. "Common in July."

18. PHYCIODES THAROS, *Drury.* (Forms MARCIA, *Edw.*; MORPHEUS, *Fabr.*) Abundant throughout Ontario, Quebec and the Maritime Provinces. Nepigon, Port Arthur, Sault Ste. Marie, Sudbury, Amherstburg, County of Essex, Point Pelee, London, Hamilton, Credit, Toronto, Port Hope, Cobourg, Rice lake, Ottawa; Montreal, River Ronge district, Eastern Townships, Quebec, Cacouna, Saguenay, Little Metis, Lower St. Lawrence, Anticosti, Labrador, New Brunswick, Nova Scotia, Cape Breton, Prince Edward Island, Newfoundland, Moose Factory. Flies during June, July and August; occasionally seen in May and September. Food plants—Chelone glabra, Aster, Actinomeris helianthoides.

19. GRAPTA INTERROGATIONIS, *Fabr.* (*Polygonia Interrogationis*). Taken throughout Ontario; rare in Quebec and Nova Scotia. Sault Ste. Marie, London, Hamilton, Credit, Toronto, Port Hope, Cobourg, Ottawa; Montreal, Compton, Quebec. Form UMBROSA, *Lint.* taken June 3 to 20, July 17, August 7. Form FABRICII, *Edw.* taken in August and September, occasionally in October. Food plants—Hop, Elm, Nettle, Linden, Celtis occidentalis.

20. GRAPTA COMMA, *Harr.* (Summer form DRYAS, *Edw.*; Winter form. HARRISII, *Edw. Polygonia Comma*). Common throughout Ontario; taken also in Quebec and Nova Scotia. Nepigon, Cameron lake, London, Hamilton, Port Hope, Cobourg, Ottawa; Montreal, Chateauguay Basin, River Rouge district, Compton, Quebec, Anticosti; Moose Factory; Dalhousie, N.B. June, July and August. Food plant—Hop, Elm, Nettle.

21. GRAPTA SATYRUS, *Edw.* (MARSYAS, *Edw.*; *Polygonia Satyrus*). Very rare. Taken in Ontario at Cameron lake, near London, and at Ottawa. In Quebec at Chateauguay Basin and Brome. Also in Prince Edward Island. Food plant—Nettle.

22. GRAPTA FAUNUS, *Edw.* (*Polygonia Faunus*). Taken throughout the Eastern Provinces of Canada. Nepigon, North of Lake Huron, Hamilton, Cobourg, Ottawa; Montreal, Brome, Missisquoi county, Quebec, Little Metis, Gulf of St. Lawrence, Nova Scotia, Newfoundland, Moose Factory. Has been taken in each month from May to October. Food plants—Green Alder, Willow, Birch, Currant, Gooseberry.

23. GRAPTA PROGNE, *Cram.* (*Polygonia Progne*). Fig 5. Common throughout the Eastern Provinces of Canada. Nepigon, Fort William, Sault Ste. Marie, Vermilion lake (Lake Huron), Sudbury, Cameron lake, Amherstburg, London, Hamilton, Credit, Port Hope, Cobourg, Peterborough, Ottawa; Montreal, River Rouge district, Eastern Townships, Quebec, Little Metis, Godbout river, Lower St. Lawrence and Bay of Chaleur, Anticosti, Restigouche river, N.B, Nova Scotia. Lat. 54° (Kirby). Flies from May to October; earliest date May 14, latest October 20. Food plants—Currant, Gooseberry, Betula papyrifera, Elm.

Fig. 5.

24. GRAPTA GRACILIS, *Grote and Rob.* (*Polygonia Gracilis*). Taken in northern Ontario and in Quebec. Nepigon, Sudbury, Quebec, Levis, Little Metis. Flies in July, August and September. Food plant—Currant.

25. GRAPTA J-ALBUM, *Boisd-Lec.* (*Eugonia J-Album*). Common throughout the Eastern Provinces of Canada. Sault Ste. Marie, Bruce Mines, north of Lake Huron, London, Hamilton, Credit, Toronto, Port Hope, Cobourg, Lake Simcoe, Ottawa; Montreal, River Rouge district, County of Grenville, Eastern Townships, Sorel, Quebec, Little Metis, Godbout river, Bay of Chaleur, Labrador, Nova Scotia. Flies during August and September; hibernating specimens are often found during the winter in houses and

appear on the wing on warm days in March and April; taken also in May and July; autumn brood appears in September and October. Food plant—White birch.

26. VANESSA ANTIOPA, *Linn.* (*Euvanessa Antiopa*). Abundant throughout the Eastern Provinces of Canada. Nepigon, Sault Ste. Marie, north of Lake Huron, Sudbury. Lake Simcoe, London, Credit, Toronto, Hamilton, Port Hope, Cobourg, Ottawa; Montreal, Eastern Townships, River Rouge district, Quebec, Little Metis, Rimouski, Godbout river, Anticosti, Labrador, Newfoundland, Nova Scotia, Prince Edward Island. Hibernated specimens appear at the end of March and early in April; common throughout the whole summer, the second brood appearing in August; common in September, and individuals are found till the end of October. Food plants—Willow, Elm, Poplar.

27. VANESSA MILBERTI, *Godt.* (*Aglais Milberti*). As widely distributed as the preceding species. Nepigon, Sault Ste. Marie, Amberstburg, London, Hamilton, Credit, Toronto, Port Hope, Cobourg, Ottawa; Montreal, River Rouge district, Eastern Townships, Quebec, Isle of Orleans, Little Metis, Godbout river, Saguenay, Labrador; Newfoundland, Cape Bretŏn, Nova Scotia, Moose Factory. Hibernated specimens appear in March and April; more or less abundant throughout the summer; individuals seen in October as late as the 18th. Food plant—Nettle.

28. PYRAMEIS ATALANTA, *Linn.* (*Vanessa Atalanta.*) Abundant throughout the Eastern Provinces of Canada. Nepigon, Sault Ste. Marie, London, Point Pelee, Hamilton, Credit, Toronto, Port Hope, Cobourg, Ottawa; Montreal, River Rouge district, Sorel, Quebec, Little Metis, Godbout River, Anticosti, Labrador, Newfoundland, Nova Scotia, Prince Edward Island, Moose Factory. Taken from May to August; very abundant in June when the lilacs are in blossom; occasionally seen in October. Food plants—Nettle, Hop.

29. PYRAMEIS CARDUI, *Linn.* (*Vanessa Cardui*). Abundant everywhere. Nepigon, Sault Ste. Marie, London, Hamilton, Credit, Toronto, Port Hope, Cobourg, Ottawa; Montreal, River Rouge district, Eastern Townships, Sorel, Quebec, Cacouna, Little Metis, Grand Metis, Godbout river, Anticosti; Dalhousie and St. John, N.B, Nova Scotia, Newfoundland, Prince Edward Island. Flies at the end of May and throughout the summer months till September; occasionally seen in October. Food plants—Thistle, Mallow, Hollyhock, Burdock, Wild Sunflower.

30. PYRAMEIS HUNTERA, *Fabr.* (*Vanessa Huntera*). Widely distributed, but not so abundant as the preceding species. Nepigon, Sault Ste. Marie, Point Pelee, London, Hamilton, Credit, Toronto, Port Hope, Cobourg, Ottawa; Montreal, Quebec, Isle of Orleans, Little Metis, Godbout river, St. John, N.B., Nova Scotia. Flies in July, August and September. Food plants—Gnaphalium, Thistle, Myosotis.

31. JUNONIA CŒNIA, *Hubn.* Fig. 6. Very rare in Canada. Has been taken at Chatham, Port Stanley, London, Stratford and Ridgeway in Ontario. Food plants—Gerardia, Antirrhinum, Plantago, Linaria Canadensis.

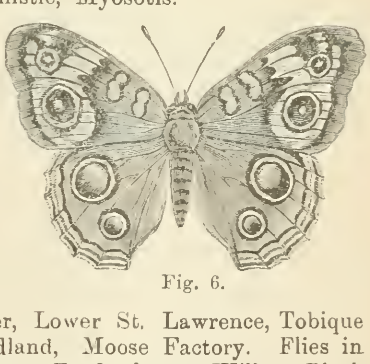
Fig. 6.

32. LIMENITIS ARTHEMIS, *Drury.* (*Basilarchia Arthemis*). Abundant throughout the Eastern Provinces of Canada Lake of the Woods, Nepigon, Sault Ste. Marie, London, Hamilton, Credit, Toronto, Port Hope, Cobourg, Lakefield, Belleville, Ottawa, Montreal, River Rouge district, Eastern Townships, Sorel, Quebec, Sherbrooke, Little Metis, Godbout river, Lower St. Lawrence, Tobique river, N.B., Nova Scotia, Cape Breton, Newfoundland, Moose Factory. Flies in June, July and August, often seen in immense numbers. Food plants—Willow, Black and Yellow Birch, Poplar, Thorn, Plum, Cherry, Amelanchier.

33. LIMENITIS PROSERPINA, *Edw.* (*Basilarchia Proserpina*). Excessively rare. Specimens have been taken at Hamilton, Roachs' Point, Lake Simcoe (August 22, 1894), Rideau Hall, Ottawa, and Halifax, N.S.

34. Limenitis Ursula, *Fabr.* (*Basilarchia Ursula.*) Very rare in Canada. Has been taken at Port Stanley, London, and in Essex county, Ontario. Plentiful at London 1893 (Moffat). Food plants—Cherry, Currant, Oak, Willow, Vaccinium, Apple, Quince, Hawthorn, Plum.

Fig. 7.

35. Limenitis Disippus, *Godt.* (*Basilarchia Archippus.*) Widely distributed, but not very abundant. Amherstburg, London, Hamilton, Credit, Toronto, Port Hope, Cobourg, Rice lake, Ottawa, Montreal, L'Orignal, Little Metis, St. John, N.B, Nova Scotia. Flies in June, July and August; occasionally seen in September and October.

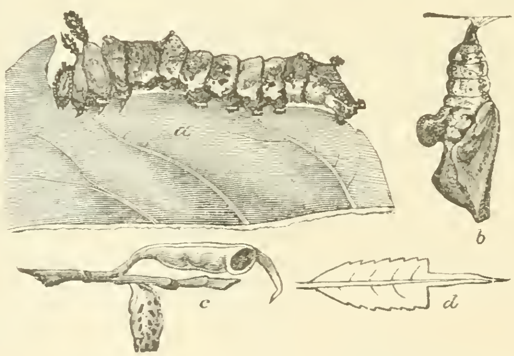

Fig. 8.

Food plants—Willow, Poplar, Plum, Apple, Oak. Fig. 7 the butterfly; fig. 8, *a*, the larva, *b*, the chrysalis, *c* and *d*, the larva case.

Sub-family *Satyrinæ*.

36. Debis Portlandia, *Fabr.* (*Enodia Portlandia.*) Very rare. In Ontario it has only been taken at Ottawa. In Quebec at Hull and Kirk's Ferry, Montreal, Chateauguay Basin, River Rouge district, Eastern Townships, Compton, Quebec; Nova Scotia. Flies in July and August. Food plants—Grasses.

37. Neonympha Canthus, *Boisd-Lec.* (*Satyrodes Eurydice*, Linn; *Neonympha Boisduvallii*, Harris.) Not very abundant. Has been taken at Sault Ste. Marie, Essex county, London, Hamilton, Toronto, Grafton and Ottawa (common) in Ontario; at Montreal, Compton and Quebec; Mingan Islands, Nova Scotia. Flies in June, July and August. Fig. 9. Food plants—Grasses and Sedges.

38. Neonympha Eurytris, *Fabr.* (*Cissia Eurytris.*) Widely distributed, and not uncommon. Sudbury, Essex county, London, Hamilton, Credit, Toronto, Port

Hope, Cobourg, Rice lake, Ottawa, Montreal, Eastern Townships, Quebec. Flies in June and July. Fig. 10. Food plant—Grasses.

Fig. 9.

Fig. 10.

39. Cœnonympha inornata, *Edw.* A very rare butterfly. Taken at Massasauga Point (Macoun), Lake Winnipeg, Sault Ste. Marie, and in Newfoundland and Labrador.

40. Erebia Discoidalis, *Kirby.* The only Eastern Canadian record is its capture at Sudbury by Mr. J. D. Evans, May 12, 1889.

41. Satyrus Nephele, *Kirby.* (*Cercyonis Nephele.*) Abundant throughout the Eastern Provinces of Canada, County of Essex, London, St. Catharines, Hamilton, Credit, Toronto, Port Hope, Cobourg, Ottawa, Montreal, River Rouge district, Quebec, Little Metis, New Brunswick, Nova Scotia, Prince Edward Island. Flies throughout July and August; taken from June 10 to 20, in Essex county, Ontario. Food plant—Grasses.

42. Satyrus Alope, *Fabr.* (*Cercyonis Alope.*) This more southern form has been taken at St. John, N.B., and in Nova Scotia and Prince Edward Island.

43. Chionobas Macounii, *Edw.* (*Oeneis Macounii.*) This rare butterfly has only been taken at Nepigon, from June 28 to July 13. Food plant—Sedges.

44. Chionobas Jutta, *Hubn.* (*Oeneis Jutta.*) A very rare and local sub-arctic species. Has been taken at Nepigon, Ottawa, the Gomin Swamp, Quebec, Bergerville, P.Q., and in Labrador. Food plant—Carices.

Sub-family *Libytheinæ.*

45. Libythea Bachmani, *Kirtl.* (*Hypatus Bachmanii.*) Fig 11. Very rare in Canada. Has been taken at Port Stanley, London and Hamilton in August. Food plant—Celtis.

Fig. 11.

Family Lycænidæ.

Sub-family *Lycæninæ.*

46. Thecla Acadica, *Edw.* Rare. Has been taken at London, Hamilton, Ottawa, Montreal and St. Rose, P.Q. Flies in July. Food plant—Willow.

47. Thecla Melinus, *Hubn.* (*Uranotes Melinus.*) Very rare in Canada. Has been taken at London, Hamilton, Montreal. Flies in July. Food plants—Hops, Beans, Cynoglossum, Cratægus.

48. Thecla Edwardsii, *Saund.* (*Falacer*, Harris.) Very rare. Has been taken at London, Hamilton, Credit and Ottawa (rare), in July. Food plant—Oak.

49. Thecla Calanus, *Hubn.* (*Inorata*, Grote-Rob; *Falacer*, Godt.) Usually rare, but sometimes abundant. Has been taken at London, Hamilton, Ottawa and Montreal, in July and August. Food plants—Oak, Butternut, Hickory.

50. Thecla Ontario, *Edw.* Taken only at Port Stanley, Ont., by Mr. E. B. Reed, in July, 1868.

51. Thecla Strigosa, *Harr.* (*Liparops*, Scud.) Rare. Taken at Cameron Lake, London, Ottawa and Montreal, July. Food plants—Thorn, Shadbush (*Amelanchier*), Blueberry (*Vaccinium*), Plum.

52. Thecla Smilacis, *Boisd-Lec.* (*Mitura Damon*, Cram.) Has been taken only at Point Pelee, Ont., by Mr. Saunders. Food plant—Red Cedar.

53. Thecla Augustus, *Kirby.* (*Incisalia Augustus.*) Has been taken at London and Ottawa, Montreal, Bergerville and Quebec, and at Halifax, N.S.

54. Thecla Irus, *Godt.* (*Incisalia Irus*) This very rare butterfly has been taken at Nepigon by Mr. Macoun, and at Montreal by Mr. Bowles. Food plant—Wild Plum.

55. Thecla Niphon, *Hubn.* (*Incisalia Niphon.*) Rare. Has been taken at London and Ottawa, Montreal, Chelsea, Sorel, P.Q., Halifax, N.S. Flies in May. Food plant—Pine.

56. Thecla Læta, *Edw.* (*Erora Læta.*) Very rare. Taken at London and York Mills, Ont., Beloeil Mountain, St. Joachim, St. Hilaire and Quebec. Flies during the latter part of May.

57. Thecla Titus, *Fabr.* (*Mopsus*, Hubn.; *Strymon Titus.*) Widely distributed, but rather rare in Canada. Nepigon, Sudbury, London, Hamilton, Credit, Toronto, Ottawa, Montreal, Oka, Eastern Townships, Quebec. Flies in July and August. Food plants—Wild Cherry, Oak.

58. Feniseca Tarquinius, *Fabr.* Widely distributed, but not common. Sudbury, London, Hamilton, Credit, Toronto, Stony Lake, Ottawa, Montreal, Cowansville, Township of Stanbridge, Island of Orleans, P.Q.; Halifax, N.S. Has been taken from May 24th, through the summer to September. Larva feeds upon plant lice (Aphides).

59. Chrysophanus Thoe, *Boisd.-Lec.* Taken in Ontario and Quebec, but very locally on the margin of rivers or lakes. Nepigon, London, Hamilton, Port Hope, Cobourg, Ottawa, Montreal, Lachine, Quebec, Eastern Townships. Flies in August and earlier part of September. Figs. 12 and 13. Food plants—Rumex and Polygonum.

Fig. 12.

Fig. 13.

60. Chrysophanus Florus, *Edw.* Five specimens of this rare butterfly were taken at Nepigon by Prof. Macoun. It has also been taken by Capt. Brown in Newfoundland.

61. Chrysophanus Dorcas, *Kirby.* Kirby's record is lat. 54°. It is reported from Labrador in July.

62. Chrysophanus Epixanthe, *Boisd.-Lec.* (*Epidemia Epixanthe*). Rarely seen, but very widely distributed; frequents the borders of swamps and peaty meadows. Has been taken at London, Toronto, Ottawa, Montreal, the Gomin Swamp, Quebec, Cape Breton, Newfoundland. Flies in July. Food plant unknown.

63 Chrysophanus Hypophlæas, *Boisd.* [*C. Americana D'Urban*] (*Heodes Hypophlæas*). Very common throughout Ontario and Quebec. Nepigon, Sault Ste. Marie, Sudbury, county of Essex, London, Credit, Toronto, Port Hope, Cobourg, Ottawa, Montreal, River Rouge district, Eastern Townships, Sorel, Quebec, Cacouna, Little Metis, Prince Edward Island, Moose Factory. Flies from the end of May to September. Food plant—Sheep's Sorrel (*Rumex acetosella*).

64. Lycæna Pembina, *Edw.* Has been taken at Cacouna, P.Q., by Mr. Saunders in July, 1866 (*Can. Ent.*, Vol. I., p. 12).

65. Lycæna Couperii, *Grote*. Rare. Has been taken at Nepigon and Brantford, Ont.; Heights of Levis, Cacouna, Little Metis and Godbout river, P. Q., Anticosti, Labrador, Newfoundland.

66. Lycæna Scudderii, *Edw.* (*Rusticus Scudderii*). Locally abundant. Has been taken at Nepigon, London, Toronto, Cobourg, north shore of the St. Lawrence, Anticosti, Labrador, Hudson bay. Cape Breton. Flies at the end of May, in June and August. Food plant—Lupin.

67. Lycæna Pseudargiolus, *Boisd-Lec.* (Winter forms Lucia, *Kirby*; Violacea, *Edw.*; summer form Neglecta, *Edw.*—*Cyaniris Pseudargiolus*). Very widely distributed. Nepigon, Sudbury, London, Hamilton, St. Catharines, Toronto, Port Hope, Cobourg, Ottawa, Montreal, Eastern Townships, River Rouge district, Quebec, Riviere du Loup, Godbout river, Anticosti, lower St. Lawrence, Labrador, Prince Edward Island. Lat. 54° (Kirby). Appears very early in the spring, and may be found in April and May (forms *Lucia* and *Violacea*); in June and July in the more northern localities; the form *Neglecta* is found during June, July and August, and into September. Food plants—Cornus, Actinomeris, Viburnum, Acer spicatum, Willow, and a great variety of other plants (vide Scudder's Butterflies of the Eastern United States and Canada, p. 938).

68. Lycæna Comyntas, *Godt.* (*Everes Comyntas*). Not uncommon. Has been taken at Nepigon, Sudbury, London, Hamilton and Ottawa; Montreal, Lachine, Chateauguay Basin. Flies in May, June, July and August. Food plants—Leguminous plants, Lespedeza, Desmodium, Clover, Lathyrus.

Family Papilionidæ.

Sub-family *Pierinæ*.

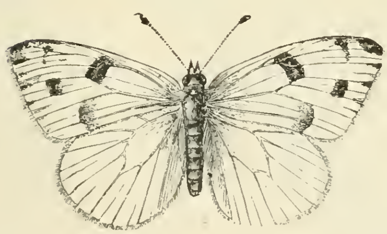

Fig. 14.

Fig 15.

69. Pieris Protodice, *Boisd.-Lec.* (*Pontia Protodice*). Formerly common, but now rarely seen. Sault Ste. Marie, Amherstburg, Port Stanley, London, Hamilton, Toronto,

Fig. 16.

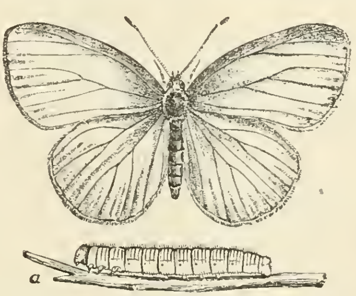

Fig. 17.

Fig. 18.

Cobourg, Lachine, P.Q. Has been taken from May to October. Food plants—Cabbage and other cruciferous plants. Fig. 14, male; fig. 15, female; fig. 16—*a* larva, *b* chrysalis.

70. Pieris Napi, *Esper.* (Forms Oleracea-hiemalis, *Harr.*; Borealis, *Grote*; Frigida, *Scud.*; Virginiensis, *Edw.*; Oleracea-æstiva, *Harris*). Taken throughout the Eastern Provinces of Canada. Formerly very abundant, but since the wide-spread introduction of *P. rapæ*, this and the preceding species have become quite rare. Recorded from Nepigon, Sault Ste. Marie, Bruce Mines, north of Lake Huron, Sudbury, Collingwood, Amherstburg, London, Hamilton, Toronto, Port Hope, Cobourg, Ottawa, Montreal, Cowansville, River Rouge district, Quebec, Little Metis, Lower St. Lawrence, Anticosti, Labrador, Newfoundland, Cape Breton. Lat. 65° (Kirby). Hudson Bay. The form *Borealis* has been taken at Godbout river, P.Q.; *Frigida* at Mingan, Anticosti and the south and east coasts of Labrador; the aberrant form *Virginiensis* at Hamilton and Fort William. Food plants—Turnips and other cruciferous plants. Fig. 17 butterfly, and *a* the larva; fig. 18 chrysalis.

71. Pieris Rapæ, *Linn*, and aberrant form *var* Novæ Angliæ, *Scud.* Since its introduction to this country at Quebec, in 1858, it has spread over a large portion of the continent, and is everywhere one of the commonest butterflies. Flies from April to

Fig. 19.

Fig. 20.

Fig. 21.

October. Food plants—Cabbage and other cruciferous plants, mignonette, stocks. Fig. 19, male butterfly; fig. 20, female; fig. 21—*a* larva, *b* chrysalis.

72. Colias Cæsonia, *Stoll.* (*Zerene Cæsonia*). Mr. Scudder gives "Southern Ontario" as one of its localities, but I can find no recorded place of capture. Mr. Moffat tells me that it was taken at Long Point, Lake Erie. Food plants—Clover, Amorpha.

73. Colias Eurytheme, *Boisd.* [Forms Keewaydin, *Edw.*; Eriphyle, *Edw.*] (*Eurymus Eurytheme*). Abundant north of Lakes Superior and Huron; occasionally taken in more southern localities. Nepigon, Fort William, Port Arthur, Bruce Mines, Sault Ste. Marie, London, St. Catharines, Port Hope (Oct. 15), Ottawa, Hull, Montreal, Missisquoi county, Quebec. Food plant—White Clover.

Fig. 22.

Fig. 23.

74. Colias Philodice, *Godt.* (*Eurymus Philodice*). One of the commonest butterflies throughout the Provinces of Ontario, Quebec, New Brunswick, Nova Scotia and Prince Edward Island. Abundant from the middle of May to September; occasionally taken as early as April 9th, and as late as October 19th. Food plants—Clover, Pea, Lupin. Fig. 22, male; fig. 23, female.

75. Colias Interior, *Scud.* (*Eurymus Interior*). Abundant north of Lakes Superior and Huron; occasionally taken further east. Nepigon, Port Arthur, Fort William, Spanish river, Georgian bay, Sudbury, Ottawa, Montreal, Owl's Head Mountain, Quebec, Heights of Levis, Moose Factory. Flies in July and August. Food plant—Willow.

76. Colias Interior, *var* Laurentina *Scud.* Is recorded from Montreal (Caulfield, July, 1874); Quebec (Fyles); Godbout river, Anticosti, Mingan, Labrador, New foundland, Prince Edward Island, Cape Breton.

77. Terias Nicippe, *Cram.* (*Xanthidia Nicippe.*) This southern butterfly has been once taken at Point Pelee, Ont. Food plant—Cassia.

Terias Mexicana, *Boisd.* has also been taken at Point Pelee, by Mr. Saunders, June 29, 1882.

78. Terias Lisa, *Boisd-Lec.* (*Eurema Lisa*) Has been taken at Point Pelee (June 29, 1882, Saunders); Port Stanley (August, 1861); London, Hamilton (Moffat, June 23, 1882,) Food plants—Clover, Cassia.

Sub-Family, *Papilioninæ.*

79. Papilio Ajax, *Linn.* [Form Marcellus, *Boisd.*] (*Iphiclides Ajax.*) Occasionally taken in June in the extreme southern parts of Ontario, North Ridge, county of Essex, Point Pelee, Long Point, Ridgeway, Komoka, near London. Food plant—Pawpaw.

Fig. 24.

80. Papilio Turnus, *Linn.* (*Jasoniades Glaucus.*) Abundant throughout the Provinces of Ontario, Quebec, New Brunswick, Nova Scotia, Prince Edward Island; also in Newfoundland. Flies during the latter part of May, throughout June and part of July, sometimes in enormous numbers. Food plants — Apple, Thorn, Aspen, Poplar, Willow, Cherry, Alder, Basswood, Oak, Black and White Ash, Birch, Aspen, Tulip wood, Amelanchier Canadensis. Fig. 24, butterfly; Fig. 25, caterpillar.

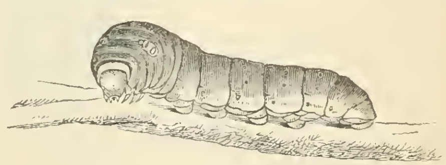

Fig. 25.

81. Papilio Cresphontes, *Cram.* (*Papilio Thoas, Boisd.; Heraclides Cresphonte* Fig. 26. Spreading gradually through southwestern Ontario. Has been taken in the

county of Essex, at Amherstburg, Sandwich, Windsor, Belle Isle, Chatham, Point Pelee, St. Thomas, Long Point, Thedford, Dunnville, London, Dundas, Hamilton, Ridgeway,

Fig. 26.

Toronto, Roach's Point, Lake Simcoe, Sparrow lake. In Quebec at Chateauguay Basin and at St. John, N. B. Flies in June, July and August. Food plants—The Citrus family, Rutaceæ, Prickly Ash, Hop-tree (*Ptelea trifoliata*) Dictamnus fraxinella, Ruta graveolens.

82. Papilio Brevicauda, *Saunders.* Taken only in the extreme east; Godbout River, Anticosti, Labrador, Newfoundland, Gaspè and Dalhousie, N. B. Food plants—Ligusticum, Pastinaea.

Fig. 27.

83. Papilio Asterias, *Fabr. Papilio, Polyxenes.*) Fig. 27. Abundant throughout the western peninsula and eastern parts of Ontario; not common in the Province of

Quebec. County of Essex, Amherstburg, London, West Flamboro, Hamilton, Credit, Toronto, Port Hope, Cobourg, Ottawa, Montreal, "150 miles east and west of Quebec" (Bowles), Lorette, Cacouna, Little Metis, Labrador, New Brunswick, Newfoundland. Flies at the end of May and through June, July and August; most abundant during the last-named month. Food plants—Celery, Carrot, Parsley and other umbelliferous plants.

84. Papilio Troilus, *Linn.* (*Euphœades Troilus.*) Confined to the western peninsula of Ontario, where it is common. County of Essex, Point Pelee, Dunnville, London, West Flamboro, Hamilton, St. Catharines, Credit. Flies during June, July and August. Food plants—Spice bush, Sassafrass.

Fig. 28.

85. Papilio Philenor, *Linn.* (*Laertias Philenor.*) An occasional visitor to southwestern Ontario. Long Point, Ridgeway, Woodstock, West Flamboro, Hamilton, Grimsby, Humber Plains, Toronto. Only seen in the month of June. Food plant—Dutchman's Pipe (*Aristolochia sipho*) Fig. 28, butterfly; Fig. 29 *a* and *b*, chrysalis; Fig. 30, caterpillar.

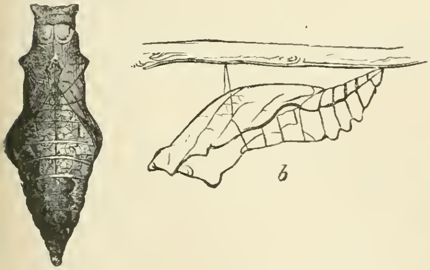

Fig. 29.

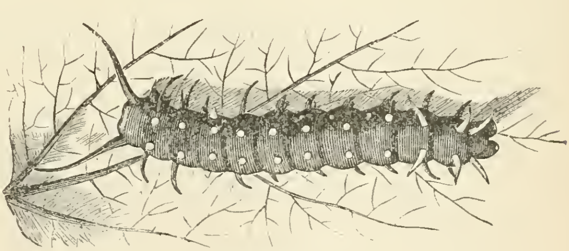

Fig. 30.

Family *Hesperidæ.*

86. Carterocephalus Mandan, *Edw.* Taken in the northern parts of Ontario and in Quebec. Nepigon, Sault Ste. Marie, St. Joseph's Island, Lake Huron, Sudbury, Bobcaygeon, Ottawa, Lake Mistassini, Lachine, Compton, Bergerville, Levis, Quebec, Godbout river, Anticosti, Labrador. Flies in June and July. Food plant—Grass.

87. Ancyloxypha Numitor, *Fabr.* (*Heteropterus Marginatus, Harris.*) Widely distributed but extremely local. Point Pelee, London, Hamilton, Grimsby, St. Cathar-

ines, Township of Shefford, River Yamaska, P. Q. Has been taken in June, August and September. Frequents low marshy places. Food plant—Grass.

88. PAMPHILA MASSASOIT, *Scud*, (*Poanes Massasoit.*) Only recorded by Mr. Scudder as from "Ontario (Saunders)"

89. PAMPHILA ZABULON, *Boisd.-Lec.* [Forms HOBOMOK, *Harris;* POCOHONTAS, *Scud.*] (*Atrytone Zabulon*). Not uncommon in one or other of its forms throughout Ontario and Quebec. Taken at Nepigon, Sudbury, county of Essex, London, Hamilton, Credit, Toronto, Ottawa. Montreal, Chateauguay Basin, Compton, Quebec, Dalhousie, N. B., Nova Scotia. Flies in June and July. Food plant—Grass.

90. PAMPHILA MANITOBA, *Scud.* (*Erynnis Manitoba*) Inhabits northern Ontario and Quebec. Nepigon, Sudbury, Kirk's Ferry, Quebec, Levis, Cacouna, Riviere du Loup, Little Metis, Gaspe. Taken in July, August and September.

91. PAMPHILA LEONARDUS, *Harris.* (*Anthomaster Leonardus.*) Taken sparingly in Ontario and Quebec. London, Hamilton, Credit, Toronto, Port Hope, Chelsea, Hull, Montreal, Chateauguay Basin. Flies in July and September. Food plant—Grass.

92. PAMPHILA OTHO, *Sm.-Abb.* [Variety EGEREMET, *Scud.*], (*Ætna, Scud*). Very rare. Has been taken at Hamilton, London, Prescott, and in the Eastern Townships, P. Q. (Fyles).

93. PAMPHILA PECKIUS, *Kirby.* [WAMSUTTA, *Harris*] (*Polites Peckius*) Common and very widely distributed. Nepigon, Sudbury, London, Hamilton, Credit, Toronto, Port Hope, Cobourg, Ottawa, Montreal, Quebec, Little Metis, New Brunswick, Nova Scotia, Cape Breton, Moose Factory, Prince Edward Island. Flies in June, July, and occasionally in August. Food plant—Grass.

94. PAMPHILA MYSTIC, *Scud.* (*Thymelicus Mystic.*) Frequents the same localities as the preceding. Nepigon, Sudbury, London, Hamilton, Port Hope, Ottawa, Montreal, Chateauguay Basin, Quebec, Cacouna, Ha! Ha! bay; Nova Scotia, New Brunswick and Prince Edward Island. Flies in June, July and August. Food plant—Carex.

95. PAMPHILA CERNES, *Boisd.-Lec.* [AHATON, *Harris.*] (*Limochores Taumas, Fabr.*) Very abundant throughout eastern Canada. Nepigon, London, Hamilton, Credit, Toronto, Port Hope, Ottawa, Montreal, Chateauguay Basin, Eastern Townships, Quebec, Nova Scotia, Cape Breton, Prince Edward Island. Flies in June and July. Food plant—Grass.

96. PAMPHILA MANATAAQUA, *Scud.* (*Limochores Manataaqua.*) The only Canadian localities I have found are "Canada West" (British Museum Catalogue); Prince Edward Island (Macoun.)

97 PAMPHILA METACOMET, *Harris.* (*Euphyes Metacomet.*) Not common. Has been taken at Nepigon, Sudbury, London, Hamilton, Ottawa, Montreal, Heights of Levis. In July. Food plant—Carex.

98. PAMPHILA PONTIAC, *Edwards.* (*Limochores Pontiac.*) The only Canadian locality is Montreal (Caulfield, teste Strecker.)

99. PAMPHILA DION, *Edw.* (*Limochores Palatka, Edw.*) Taken only at Hamilton by Mr. Moffat.

100. PAMPHILA VIATOR, *Edw.* (*Phycanassa Viator.*) This southern butterfly has been taken at Hamilton by Mr. Moffat, and on the Humber Plains near Toronto by Mr. Geddes.

101. PAMPHILA VITELLIUS, *Sm.-Abb.* [*Delaware, Edw.; Logan, Edw.*] Taken only at London by Mr. Saunders.

102. AMBLYSCIRTES VIALIS, *Edw.* Rare. Has been taken at Nepigon, Sudbury, London, Ottawa, Chelsea, Montreal and Eastern Townships. In June and July. Food plant—Grass.

103. AMBLYSCIRTES SAMOSET, *Scud.* Occurs even more rarely than the preceding. Has been taken at Ottawa, May 27, 29; Eastern Townships and Levis, P.Q., Nova Scotia. Flies in the end of May and in June.

104. Pyrgus Tessellata, *Scud.* (*Hesperia Montivaga, Reak*). A southern and western species which has only been reported from Essex county, Ontario. (Lowe, Can. Ent., vii., p. 140.)

105. Pyrgus Centaureæ, *Ramb.* (*Hesperia Centaureæ*). A northern circumpolar species. It has been taken at Wabigoon, on the C. P. R. (about 200 miles west of Fort William), and in Labrador (Low).

106. Nisoniades Brizo, *Boisd.-Lec.* (*Thanaos Brizo*). Widely distributed, but not very common. Sudbury, London, Hamilton, Toronto, Ottawa, Montreal, Quebec, Nova Scotia, Prince Edward Island. Flies in June. Food plant—Scrub Oak.

107. Nisoniades Icelus, *Lint.* (*Thanaos Icelus*). Abundant locally, but not common. Nepigon, Sudbury, Hamilton, Ottawa, Montreal, Quebec, Nova Scotia. Flies in June and July. Food plants—Aspen, Willow, Witch-hazel.

108. Nisoniades Lucilius, *Lint.* (*Thanaos Lucilius*). Only recorded in Ontario from London and Ottawa. Flies in May, July and August. "In 1893 so abundant at Ottawa as to be noticeably injurious to garden Columbines" (Fletcher). Food plant—Wild Columbine (Aquilegia Canadensis).

109. Nisoniades Persius, *Scud.* (*Thanaos Persius*). Has been sparingly taken in the county of Essex, London, Hamilton, Toronto, Ottawa and at Saguenay, P. Q. Flies in May and June. Food plants—Willow, Poplar.

110. Nisoniades Martialis, *Scud.* (*Thanaos Martialis*). A southern species, which has been taken at London, Hamilton and Toronto.

111. Nisoniades Juvenalis, *Fabr.* (*Thanaos Juvenalis*). Not common. Has been taken at London, Hamilton, Toronto, Cobourg, Ottawa (rare). Flies in May and early June. Food plants—Oak and various leguminous plants.

112. Pholisora Catullus, *Fabr.* Not common. Has been taken in the county of Essex, Point Pelee, London, Hamilton, Toronto, Eastern Townships and Quebec. Flies in June Food plants—Chenopodium, Aramantus.

113. Eudamus Electra, *Lint.* (*Thorybes Electra*). This butterfly has only been taken by Mr. Moffat at Hamilton. The only specimen, a female, is in the possession of Dr. Holland, of Pittsburg, Penn.

114. Eudamus Pylades, *Scud.* (*Thorybes Pylades*) Common in certain localities. Has been taken at Nepigon, Sudbury, London, Hamilton, Ottawa, Montreal, Chateauguay Basin. Flies in May, June and July. Food plants—Clover, Lespedeza and other leguminous plants.

115. Eudamus Bathyllus, *Sm.-Abb.* (*Thorybes Bathyllus*). This southern species has been taken in the county of Essex, at London, Hamilton, Toronto, Rice lake, Ottawa. Flies in June and July.

116. Eudamus Tityrus, *Fab.* (*Epargyreus Tityrus.* Very widely distributed throughout Ontario and Quebec; common, but not numerous. County of Essex, Point Pelee, London, Hamilton, St. Catharines, Credit, Toronto, Port Hope, Ottawa, Montreal, Chateauguay Basin, Quebec. Flies in May, June and July. Food plant—Locust, Acacia, Lathyrus palustris, Apios tuberosa.

Postscript.—Since this list was prepared I have learnt that the following species has been taken within our limits :

117. Lycæna Aquilo, *Boisd.* [*Franklinii, Curtis*]. This northern species was taken at Nepigon by Mr. Fletcher, July 7, 1894. It is also reported from Labrador, Hudson straits, Newfoundland (Gosse).

The following species do not come strictly within the limits that we have adopted, but may be mentioned as possible additions to our fauna :

Argynnis Polaris, *Boisd.* Hudson straits (Payne and Bell).

Chionobas Calais, *Scud.* Rupert House, Hudson bay ; Newfoundland.

Chionobas Taygete, *Hubner.* Hudson straits (Payne).

Chionobas Semidea, *Say.* Labrador, Hudson straits, Newfoundland.

Chionobas Crambis, *Frey.* Hudson straits (Payne).

Chionobas Œno, *Boisd.* Labrador (Couper).

Chionobas Bore, *Esp.* Labrador (Couper).

Lycæna Aster, *Edw.* Newfoundland (Gosse, Mead).

Lycæna Lygdamus, *Doubl.* Labrador (Couper).

Papilio Machaon, *Linn.* Rupert House, Hudson bay (Payne).

Colias Boothii, *Curt., var.* Chione, *Curt.* Hudson straits (Payne, Geddes, Can. Ent., xxi., 59).

Colias Hecla, *Lef.* Hudson Straits (Payne).

Colias Edwardsii, *Behr.* Fort William (Geddes).

Colias Nastes, *Boisd.* Labrador; Hudson straits (Payne).

Colias Labradorensis, *Scud.* Labrador.

Colias Scudderii, *Reak.* Labrador, Hudson bay.

THE PITCHER PLANT MOTH.

(*Exyra Rolandiana*, Grt)

By James Fletcher, Ottawa.

There are few of our native plants of so much interest as our native pitcher-plant, *Sarracenia purpurea*, from its peculiar beauty and the curious shape of its leaves and flowers, and there are few insects more interesting than the pretty little moth *Exyra Rolandiana*, of which the caterpillars or cocoons may generally be found by making a close search inside the leaves of the pitcher-plant during the month of June or early in July.

This moth was first described by Mr. A. R. Grote in *Psyche*, vol. ii., 1877, page 38, from specimens reared by Mr. Roland Thaxter, at Newton, Mass. It is a small, thick-set insect, about three-eighths of an inch in length, of a dark, metallic, purplish hue which on the forewings is relieved by a yellowish discal patch. The base of the wings is deep red. The dark color on the wings of the females is much blacker than in the other sex. The hind wings in both sexes are black. When at rest the wings are sloped like those of a *Plusia*.

In the *Canadian Entomologist* for 1874, vol. vi., page 207, Prof. Riley contributed an article "On the Insects More Particularly Associated with *Sarracenia variolaris*," and in this article he treats of the closely allied moth, *Xanthoptera semicrocea*, in a most entertaining manner, giving figures of all its stages. The insect-catching power of the pitcher-plants is well known and has been frequently referred to. By an examination of the decaying remains, which may be at any time found in the leaves, it will be seen that insects of almost all orders fall a prey to these treacherous death traps. Ants, however, seem to far outnumber all other kinds of insects, and Prof. Riley suggests that the acidulous properties which their decomposing bodies give to the liquid, with which the lower portion of the pitcher is always filled, render it all the more potent as a solvent of the bodies of the entrapped insects, from which doubtless the plants derive benefit, if indeed they be not, as some believe, truly insectivorous. The leaf of the pitcher-plant, from its shape, namely that of a hollow tube tapering to a point at the base, swollen a little above the middle and contracted at the mouth, forms a trap from which it is very difficult for any insects to escape when they have once entered. In addition to the shape of the leaf there are other characters which add to the difficulty of egress. Above the mouth of the pitcher is a wide expanded hood with stiff bristles pointing down towards the opening, and any insect settling upon this expansion is unconsciously directed toward the danger lying beneath, by finding it, when attempting to walk, much easier to go in the direction of the bristles. The orifice of the pitcher is highly polished and difficult for most insects to find a footing upon; experience shows that a great many fall into the trap. Once inside, they are met with new dangers; the lower third of the pitcher is filled with water, and should they succeed in crawling out of this, the upper portion of the tubes down to the swollen part is thickly beset with fine bristles pointing downward, so that it is almost impossible for luckless captives to regain their liberty. There are, however, a few kinds of insects which are able to brave these dangers with impunity. One of these is a large flesh fly, of which the white maggots may generally be found during the summer revelling in the decomposing remains of other insects at the bottom of the pitcher. When full-grown, they bore their way out through the walls of the leaf and pupate in the surrounding moss. Another species is the pretty little moth referred to above, of which I have studied a few specimens every summer for the last three years.

My first acquaintance with this insect was upon finding the moth inside a pitcher in June, 1890. Since that time I have collected similarly located larvæ of various sizes and the cocoons. I have also bred the larvæ from atter the third moult in confinement.

Mr. Roland Thaxter says: "The larvæ of *Exyra Rolandiana* may be found in the smaller leaves of *Sarracenia purpurea* in this vicinity (Newton, Mass.) as soon as the snow is off the ground early in spring, apparently having moulted two or three times; they are then of a dull reddish brown and about 6 mm. long. As soon as the weather grows warmer, they increase in size rapidly, and, having eaten the leaf in which they have hiber nated, betake themselves to the larger leaves, which they begin to eat after having made a hole near the base to let the water out and after having spun a close web over the mouth. The larva reaches its full growth about the first of May and later, when it is about 20mm. long, of a dull carmine or brown color, lighter, sometimes white, between the segments. The cocoon is spun in the leaf of loose white silk, the larva changing to a pupa a few days after spinning. The imago appears early in June. There is a good deal of variation in the color of the females, some being much brighter than others. The following are the extreme measurements of both sexes: males, 26-20mm., females 21-16mm. In its habits it resembles *E. semicrocea*, generally backing down towards the bottom of the leaf when disturbed, and using its wings in ascending. I notice that the frenulum at the base of the wings is very long in this species, and, as well as I could see, the moth seems to use it when crawling up the leaf. This species is very delicate and difficult to rear."

I have never found the larva at Ottawa before the beginning of June, and they had most of them at that time moved to a new leaf, but their presence on a plant was easily detected by the brown dead patch on the leaf where they had fed the year before and which showed plainly on the outside. The leaves containing the larvæ, moreover, as often as not, had some water in them. This, of course, may have resulted from the *débris* at the bottom having stopped up the hole observed by Mr. Thaxter. On one or two occasions when the larvæ were shaken off into the water, they floated on the top and easily regained their places on the sides of the pitcher. In all instances the surface of the leaf was eaten at one place only, generally near the top inside the leaf, the outside skin being left intact. The larva is sluggish and seldom moves from its feeding ground until full grown, when it spins a loose cocoon of very fine cobwebby silk, either against the side of the pitcher or, in two instances, beneath the surface of the mass of decomposed insects and its own excreta. The web over the mouth of the pitcher, although very fine, seems to keep out quite effectually all other insects after the leaf has been taken possession of by the larva. The time of appearance of this moth is rather extended. Moths have been taken here by the first week in June, and at the same time a very small larva was found which did not give the perfect insect until the 12th of July.

The following is a description of this caterpillar when full-grown: Length, when extended, three-quarters of an inch; spindle-shaped; distinctly segmented; general outline closely resembling the larva of *Xanthoptera semicrocea*, figured by Prof. Riley on page 208 of the *Canadian Entomologist*, vol. vi., but lacking the fleshy processes of the abdominal segments; head and first segments small; segments 2-7 gradually enlarging to 3 mm., and then tapering to the posterior extremity; each segment velvety claret color, the velvety hairs only in the central part of the segments; the intrasegmental sutures smooth, pale, in some specimens almost white; head white, marked symmetrically on each side with three black marks, the uppermost almost round, the middle one crescent-shaped, and the lowest, above the ocelli, comma-shaped; spiracles brown, ringed with black; on each segment about six small black tubercles bearing slender tawny bristles; thoracic feet and pro-legs darkened externally. When walking this caterpillar has the same half-looper appearance as the caterpillars of the *Plusias*, due to the fact that like them it has only two pairs of abdominal pro legs. At the same time the fore part of the body is moved from side to side with a wavering motion.

Before spinning its cocoon the caterpillar ceases feeding for about a day and then spins its flimsy cocoon through which the chrysalis can be easily seen. The pupal stage lasts between 15 and 19 days. The moth when it emerges crawls up the sides of the pitcher and easily forces its way through the gossamer-like covering.

CATASTEGA ACERIELLA Clemens, SEMASIA SIGNATANA Clemens.

By The Rev. T. W. Fyles, South Quebec.

In my notes on "The Season of 1893," published in the Society's last Report, I described the Catastega larva and pupa. In telling of the habits of the larva I said, "Then it bites away portions of the inner skin of the leaf and proceeds to make itself a case" This, without addition may be somewhat misleading.—*It makes its case of its excrementa*. The larva vacates its case, or rather *tube*, and drops from the tree about the 15th of September. The perfect insect appears in the middle of April next ensuing. The following is a description of it:

Length of body one-fourth of an inch. Expanse of wings five-eighths of an inch. Colors, grey and brown. Antennæ, filiform, grey; palpi, large and pale grey; face, clothed with long, pale grey, feathery scales; eyes, protuberant, pale grey; thorax, grey; abdomen, brownish grey; legs, feathered throughout, pale grey—the tarsi barred with brown on the upper side, as are also the tibiæ of the middle and foremost pairs; primaries, pale grey, having numerous, dark-brown lines, running from the costa with a backward curve for about one-third of the width of the wing; having also three conspicuous patches of dark brown, one—somewhat triangular—in the centre with an angle touching the costa, and one on each side of this, running from the inner margin about half-way across the wing—the base and outer angle of the wing are clouded with brown; secondaries, brownish grey, darkening towards the hind margin; fringes of all the wings grey.

On April 17th I sent specimens of the moth to Professor Fernald, and said:—"I dare say the moth is known under another name. If this be the case, which name will stand good?" To this he very kindly replied. "I am in receipt of your letter enclosing specimens of *C. aceriella* Clem. which prove to be *Semasia signatana* Clem. and this last name will hold, because it was given to an imago which was properly described, and the type is still preserved in the collections of the Am. Ent. Soc. in Phil., and because the former name and description were for the early stages of some unknown insect."

NOTES ON A FEW CANADIAN COLEOPTERA.

By W. Hague Harrington, F R.S.C., Ottawa.

Hippodamia 5, signata, Kirby.—Fig. 31 (much enlarged) In the summer of 1893 I collected in a swampy meadow some coccinellids with the hope of obtaining hymenopterous parasites from them. In this I was not successful, but from a specimen of the species named there emerged two individuals of a small, white hair snake (Gordius ?) about two inches long.

Fig. 31.

Brachyacantha ursina, Fab. This beetle has been very abundant at Ottawa the past two seasons, although formerly I had only found occasional individuals. During July and August it occurred commonly upon milkweeds About the end of April last year, in examining colonies of ants under stones, I discovered in a colony of the small brown ant (*Lasius alienus*) four larvæ which were devouring plant-lice, which were feeding upon the roots of grass after having been wintered by the ants. These larvæ were whitish and powdery, like the aphides themselves, and were 6 mm. long and 2 mm. wide tapering only slightly toward the extremities. Recognizing them as coccinellid larvæ, I secured them and placed one in alcohol. The remaining three were kept in a small jar with a few of the aphides, but they did not appear to eat any more, and a day or two later had gathered in a group and formed for themselves almost globular cocoons of white flocculent secretions, in which they pupated. The imagos emerged between the 15th and 20th June, and proved to be *B. ursina*, whose larval habits have not been described so far as I can ascertain with the literature at hand.

Antherophagus ochraceus, Melsh. This beetle is found sparingly upon flowers, such as the spiked-maple, goldenrod, etc. On one occasion I observed a humble bee (*Bombus terricola*), upon a currant bush, and evidently in trouble. Closer observation showed that some small insect had seized her by the end of her tongue, and was retaining its hold in spite of the bee's frantic exertions to dislodge it with her front legs. I secured the bee in my cyanide bottle and when she was dead found that her assailant was still attached to her tongue, and was a specimen of *A. ochraceus*. They are still together in my cabinet. Dr. Riley has, I think, mentioned this species as occurring in the nests of Bombus, but I cannot find the reference at present. Had the beetle in this instance merely attached itself to the bee by accident, or was it intent on getting free transportation to the bee's nest ? If the latter were the case it probably intended to attach itself to the leg, and seized the tongue in mistake.

Oestodes tenuicollis, Rand. This rather pretty elater has been one of the beetles which I had always been expecting to turn up at Ottawa, but which I had never found until this summer, when several were taken upon goldenrods on an island below the city, and one also in a field in the suburbs.

Poecilonota cyanipes, Say. This fine little buprestid is rare, and only occasionally found upon willows and poplars, upon the former of which one specimen was taken during the past season.

Anthaxia aeneogaster, Lap., (*inornata*, Rand.) The habits of this pretty little species appear to be somewhat different to those of our other species of Anthaxia, which are generally obtained by beating trees during the summer, whereas this species usually is found earlier in the season, and nearly always on flowers, such as trilliums, etc. Three were taken on the 20th June last in the flowers of *Cypripedium pubescens*, the Yellow Ladies' Slipper.

Hydnocera difficilis, Lec. Last spring I collected a number of the small, round, flat spider nests, which may be commonly found adhering to stones. They are of a tough consistence, and somewhat glistening surface, but I do not know the name of the species which constructs them. They are frequently infested by a Pezomachus, the oblong cocoon of which can easily be seen when the spider's cocoon is held up to the light. From one of the cocoons which I supposed to contain a Pezomachus there came forth a beetle of this species. The hole cut by it was more irregular than the orifice by which the hymenopterous parasite issues, and exposed to view within the exuviæ of the beetle.

Cupes concolor, Westw. Some years ago I captured one of these beetles when beating shrubbery on the edge of a small lake, but it did not turn up again until this year, when one was found in my bed-rcom on the evening of July 28th. It had apparently flown in the window, attracted by the electric lamp.

Saperda lateralis, Fab. On June 24th I captured near Hull a beautiful example of this elegant longicorn. My only previous capture of the species was made with a paddle as I was crossing the Ottawa. My canoe was in mid-stream when I saw a rather uncommon looking beetle flying by, and I could just reach it with the paddle, to the wet surface of which it stuck ; such are the accidental captures which do not throw much light on the localities to search for further specimens.

Chalmys polycocca, Lac. This beetle was more than usually abundant the past season, and did considerable damage to blackberries, the foliage of which was often so badly riddled as to be virtually destroyed. The beetle is readily recognized by its almost globular, bronzed and corrugated body, and the grubs can be easily found, as they live in black ob-conical cases which are quite conspicuous upon the riddled leaves and stems. A number of the larval cases were collected and kept in breeding jars with a hope of securing parasites, but only beetles were obtained. From one pupa case, however, there sprouted a small slightly club-shaped fungus about 4 mm. long.

Phyllodecta vulgatissima, Linn. This beetle occurred in great abundance upon willows on an island below the city, and during the months of July and August the beetles and their larvæ almost entirely destroyed the foliage of some low-growing species. The beetle had never previously been observed in such numbers near Ottawa.

Diabrotica longicornis, Say. This insect was described in 1824 from specimens found near the Rocky Mountains, and is a common species in several of the United States, especially in Illinois, Iowa and Missouri. It has been frequently a very serious pest to corn, in the roots of which the grubs burrow. A very complete account of its life-history and ravages may be found in a report by Prof. Forbes (10th Rept. of State Entomologist, Illinois), which contains good illustrations of the various life stages of the insect. I do not find that it has ever been recorded from Canada, nor can I find any mention of the northerly and easterly limit of its distribution. It will therefore, I think, be of considerable interest to record the occurrence of this pretty little greenish beetle at such a far easterly point as the head of the Bay of Fundy. On Sept. 8th, 1890, I found it quite abundantly on the Big Tantramah Marsh near Aulac, New Brunswick, which is almost on the boundary line between that province and Nova Scotia. It may be added that these and similar dyked lands are always spoken of as the " marsh." The beetles were found upon the flower-heads of the common large thistle (*Cnicus lanceolatus*), apparently feeding upon the pollen. Thirty or more were easily secured upon a small patch of the thistles. But little corn is grown in the neighborhood, nor am I aware of the occurrence there of ragweed, in which the beetle has also been stated to breed, and it seems probable that it must find a living in the roots of some of the larger grasses.

Nacerdes melanura, Linn. This beetle, introduced from Europe, is, according to Dr. Hamilton, rather rare in America. Some years ago I captured one on a wharf in Sydney, N.S., and on June 26th last I found another on a building in this city.

Corphyra Newmani, Lec. Four or five springs ago I noticed a curious behavior on the part of this beetle. Specimens were twice found mounted upon *Melöe niger*, but for what purpose was not apparent, unless they were attracted by the oil exuded by the blister-beetle. The specimen which I have in my cabinet is dated May 22nd. It is a male, as is also the Meloe upon which it was captured. The species is not uncommon here on flowers.

Melöe sps. ? Frequently when collecting hymenoptera I find upon some of the smaller bees, such as Halictus, the minute triungulin larvæ of Meloe. They generally are attached to the posterior femora or to the hairs at the base of the abdomen, and several are sometimes found on one bee. One day last season I saw what seemed to me a new species of bee with a red metathorax, but to my disappointment, when I had carefully netted it, I found it to be only the very common *Prosopis affinis*, upon which more than half a dozen of the triungulins had clustered, so as to entirely cover the metathorax. At least two species of these triungulins are common, one being yellowish, the other brownish. They occur most frequently on *Ceratina dupla* and *Halictus discus?* during the month of June. I have also found them upon the catkins of willows waiting for the visits of these bees, so as to be carried to their nests.

Barynotus Schœnherri, Zett. This European weevil, which I recorded in Vol. 23, p. 21, as occurring at Sydney, N. S., in 1884, was again found there by me last September, at a point some distance from the shore where I formerly took it. The specimen was also much fresher in appearance, and there can be no doubt that the species is definitely settled there.

Otiorhynchus sulcatus, Fab., and *Otiorhynchus ovatus*, Linn., also occur somewhat commonly at Sydney, but are very much less common than the next species to be mentioned.

Otiorhynchus rugifrons, Gyll. In a dry rocky pasture where I collected one morning, this beetle was found in great abundance. Under nearly every stone several would occur, either clinging to the under surface, or upon the roots of the grasses, etc. Great quantities of the ejectamenta of toads were seen, and the pellets were composed almost entirely of the remains of this beetle, with an occasional specimen of the preceding species. Thousands must have so perished, as fifty or more were required for one meal by the toad, and I imagine that even then he got very little nourishment, in proportion to the mass of indigestible matter swallowed.

Hypomolyx piceus, De G. This fine northern weevil does not appear in our label list, although under the synonyms *H. pinicola*, Couper, and *H. pineti*, Fab., it is recorded from several points in Canada. Last year I took a dead specimen in the leaf of a pitcher-plant some 30 miles from the city (near Casselman), but to-day (17th Nov.), in searching for *Staphylinus erythropterus* I found four fine fresh specimens at the base of a larch tree, just under the moss. From the condition of the beetles and their being all on the same tree, it seems evident that they had been bred in it; the only conifers near by were larches and cedars.

Conotrachelus anaglypticus, Say. This handsome little weevil was an addition to my Ottawa list this season; six specimens having been taken on goldenrods, upon the island previously mentioned, on August 18th and 25th.

FOOD, FEEDERS, AND FED.

By Rev. Thomas W. Fyles, F.L.S., South Quebec.

On the cover of that interesting magazine "Science Gossip," are represented incidents in the feud that seems to have known no truce since the beginning of created things. A fish has made a spring from the water to catch a fly, but has itself been seized, at one end by a kingfisher and at the other by a pike. Underneath, a water-insect is making every effort to escape from a dytiscus, whilst a perch is in eager chase of the pursuer, unmindful of the monster that with open mouth is close at its own tail. The consummation of such a series of efforts is described in another publication, which, with half the title of that just mentioned, makes a larger claim, viz., "Science." Dr. Charles C. Abbott tells us that he found a bull-frog (*Rana Catesbyana*) with enormously distended sides, and that on examining the contents of its stomach, he found a garter-snake (*Eutama sirtalis*) eighteen inches long, and a field-mouse (*Arvicola riparia*). Close examination shewed that the snake was in the very act of swallowing the mouse when the bull-frog made a meal of both of them. Science, Vol. III, p. 67.

Snakes.

I once saw a large garter-snake swallow a full-grown toad. This toad had held possession of a flower-bed in my garden. In it no doubt it had done me good service by catching various insect intruders. When I came upon the scene the snake held the toad by one of its hind legs. There was no attempt at resistance. The toad, charmed, or overcome by terror, quietly submitted, and the snake drew in both legs of its unfortunate prey as far as the haunches. At this stage of the proceedings, regardful of the toad's services, I interfered, and disturbed the snake by poking it with my walking-stick. It glided away; and I supposed, of course the toad would make off too. But no, it drew itself together and sat, as stolid as Mark Twain's celebrated frog. After a few minutes the snake came sidling back again. It rubbed its head on the ground, first on one side and then on the other, with the fawning motions of a kitten, and so approached the toad which remained apparently quite apathetic. It seized it by the hind legs as before. The gorging process went on smoothly until the trunk of the toad was reached—then came the strain! I could see the upper jaw of the snake cautiously raised and slightly protruded. Then fresh hold was taken, and the bite with effort secured. As this process was continued, the forward part of the toad's body was more and more distended with the displaced viscera and compressed air. By and by the fore-legs of the toad stuck out angularly, one on each side, and seemed to offer insurmountable difficulties—but no, they in turn were engulphed; and the last motion I saw of the unfortunate victim, as its face was drawn in, was a solemn wink, which seemed to say, "It's all right, my good Sir; it will be worse for the snake than for me. I'll give him a horrible fit of indigestion!" The whole process occupied exactly two hours. How long the toad would live in the snake's inside it is impossible to say. Two naturalists, out on a collecting tour, captured a snake a little more than a yard long, which had a peculiar lump in the middle. Whilst carrying the snake homeward by the tail, they noticed that the lump gradually approached the head. They hung the reptile to a tree still with its head downwards, and awaited developments. The mouth slowly opened, and a large toad covered with a greenish slime dropped out. After some minutes the toad recovered, "and was seemingly little the worse for its imprisonment." SCIENCE GOSSIP, 1874, p. 68.

The snake is not always a conqueror, it is sometimes, as we have already seen, a victim. I have seen a pigeon-hawk (*Falco columbarius*) pounce down upon and fly off with a garter snake; and, stranger still, I have seen a hen shake out a red bellied snake (*Storeria occipitomaculata*, Baird and Girard,) as one would snap a whip, and then gobble it up—beating back her chickens with her wings meanwhile. The air of complacency, befitting one who had done a virtuous action, with which she afterwards strutted off with her brood, was a thing to be remembered.

Besides the snakes above-mentioned we have in the province of Quebec two others that are frequently met with—the riband snake and the water snake, and two which seem to be local and rare—the milk snake and the grass snake.

The milk snake (*Coronella eximiens*, De Kay) is found on the hills bordering upon Vermont. I have taken it on Shufelt's Hill which overlooks the village of Sweetsburg. It is an exceedingly beautiful creature. Its body-color is fawn, softening down to white underneath. All along the back and sides are irregular blotches of rich warm brown bordered with very dark brown.

The grass snake (*Cyclophis vernalis*, De Kay) I have met with only in the neighborhood of Quebec. Two years ago I found a dead specimen in the road near the English Church at New Liverpool; and last summer I captured the living snake on the Island of Orleans. The circumstances of the capture were these: I had drawn down a branch of a young ash-tree to examine it for larvæ, and I was conscious of the fall of a rather heavy body. I glanced down, and at my feet was the snake just making off. I took it with my net, and examined it closely. It was about one foot eight inches long. In form it was very elegant; and its color was a delicate pea-green, without spots or markings of any sort. Underneath the hue was somewhat paler, much like that of the down on the body of the Luna moth. The eye of the snake was black, and its glance was as mild and innocent as that of a canary bird. While I was debating in my mind how I should carry it home—for I had no box with me large enough to hold it—it found a hole in the bottom of my net, escaped through it, and glided into a clump of young thorn-bushes and I saw it again no more. It frequents the trees to catch young birds and insects.

But it is when we come to interview the insect tribes that we find the most astounding series of gastronomical accommodations. One insect fattened upon another is destined to become food for a third, which in turn must fall a prey to a fourth. Consider the

SPIDERS.

We have been taught to look upon the spider as an embodiment of successful villany—of cold-blooded calculation. We hold in abhorrence its stealthy steps to entrap the innocent and unwary.

"Will you walk into my parlor?
Said the spider to the fly;
'Tis the prettiest little parlor
That ever you did spy;
You only have to pop your head
Just inside of the door,
And you'll see so many curious things
You never saw before."

Oh, the old reprobate! How much satisfaction it affords us to think that the black-headed Tit (*Parus atricapellus*) and other birds snap up without hesitation this betrayer of the innocent. But birds are not the only avengers upon its footsteps. Numerous insects make it their prey. Even that monster spider *Mygale Hentzii* (Fig. 32) of California finds a Nemesis in the "Tarantula Killer," as it is called, the *Pompilus formosus* of Say. (See the "American Entomologist," Vol. I, p. 129).

Fig. 32.

Some years ago I paid a visit to the Compton Ladies' College, which was then under the care of its public-spirited founder, the Rev. J. Dinzey and his excellent wife. I found in the cupola of the building a number of cells of a species of mud-daubing wasp, probably *Pelopœus cemetarius*, Linn. The insects had vacated their quarters, but there remained in the cells the skins of the spiders on which they, in their larval stage, had fed. Now nature abhors waste, and on these skins a number of small beetles of the species *Ptinus fur* Linn, were battening.

The mother mud wasp after building a cell crammed into it a number of spiders which she had paralyzed with her sting. Having provisioned her nest she laid an egg in it. The business of the larva that hatched from this egg was simply to make a long feast on the fresh food stored up for its use. But Walsh tells us that the larva is not in every case left undisturbed in this pleasing occupation. An ichneumon-fly (*Cryptus juncus*, Cress) sometimes pierces the wall of a cell and ejects an egg, the larva from which proceeds to dispose of the rightful occupant. Commenting upon this Walsh says: "Thus the spider preys upon flies, the mud-dauber upon the spider, and the ichneumon-fly upon the mud-dauber. 'Kill and be killed; eat and be eaten." This is the great universal law of nature." "American Entomologist," Vol. 1, p. 137.

I do not like to dismiss our friend *Ptinus fur* without further notice. He is small but he likes high living. He is a fellow of wonderful appetite! I think he outdoes in that respect the famous ostrich which indulged in ten-penny nails and broken bottles, or the African chief who despoiled a party of travellers of their supplies and was seen to eat up a pot of blister salve. It affects the dried specimens in our cabinets seasoned with oxalic acid and verdigris. Curtis found it eating an old coat; and it has been known to thrive on such gentle stimulants as *Nux vomica* and capsicums.

Not only are spiders exposed to dangers from without,—sometimes they suffer from "terrors within." The hair-snakes have been known to make use of them as hosts.

Hair-Snakes

are plentiful in the Province of Quebec. The most common of them is *Gordius varius.*

The Rev. E. A. W. King, of Waterville, obtained a worm of this species, and placed it in a dish of water, that he might observe its motions. In a short time it commenced to lay its eggs. They were in the form of a white thread, many inches long, which was gathered into a loose tangle, and through and about which the worm entwined itself, as if to hold it in safety. He did not wait for the eggs to separate and hatch, but consigned the string and the mother worm to a bottle of alcohol.

I have obtained a male *Gordius* from a larva of *Zaræa Americana*, and a White Hair-snake 10 inches long from a Lepidopterous larva, that in length, was but an inch and a quarter. The creature lay closely curled—like the spring of a bird-trap—under the skin of its victim.

Hair-snakes are often met with in strange places. A lady in Montreal, feeling thirsty in the night, took a glass and filled it from a tap in the bath-room. While drinking she felt a tingling sensation on her lip. She paused—struck a light—and to her disgust found one of these creatures in the tumbler. (Moral: Look before you drink).

I lately heard an advanced version of the old myth of the horse-hair in the water. A gentlemen accompanied a hunter on an excursion in search of moose. The hunter looked carefully into every stream they came to, and, at length, discovering Gordii, exclaimed joyfully, "Yes, moose have been here—here are hairs from them turned into snakes."

The history of the hair-snake is not yet completed. The adult worm—its form and structure—its nervous, muscular and reproductive systems, have been fully described. Its mouth is said to open upon a gullet which spreads out upon the upper end of the cellular tissue which extends through the whole length of the worm (Dr. Meissner, quoted by Dr. Leidy, "American Entomologist," Vol. II, p. 195.) Its food, which has (it should be remembered) already gone through the digestive organs of its host, is passed "by endosmosis from cell to cell" and is completely assimilated.

The eggs, the embryos, and the newly developed Gordii have all been described. The last have been seen to enter the bodies of the larvæ of Ephemera, and have been found in them *encysted.* But, between the notice of them in that condition and the record of the perfect worm, there is a gap in the history. It remains for some careful Helminthologist to fill up the hiatus. It is believed that the Gordius is one of those creatures that have to pass from one host to another (like the Trichinæ) before they can reach their perfect state. We can understand how it could pass in the May-fly to predacious insects, such as the spider and the ground-beetle, but not so readily how it could find a second host in a a vegetable devourer, such as the locust or the caterpillar. It may be that the encysted worm is cast off with the pseud-imago skin of the fly, or that it survives the decay of the fly itself, and, being caught in the herbage, is taken in by some hungry herbivorous insect. The chances against it, in this case, seem to be very great. Still, when we remember the vast number of eggs laid by one female Gordius—they have been estimated at more than six millions and a half—we must allow that there is a very broad margin for failures; and that if only a small percentage of the brood arrives at perfection, there must be a very great number, indeed, of hair-snakes that run the full length of days allotted to their kind. In the case of the tape-worm, *Tænia solium*, we know that the ova survive the decomposition of the ejected proglottides or divisions of the worm, and are swallowed by hogs and sheep as they feed upon the vegetation.

Another kind of creatures that affords us much food for reflection is the

Aphides.

One day in July of this year I found two patches of these "plant-lice" on the broad Windsor beans growing in my garden. My first impulse was to destroy the intruding insects, but entomological curiosity overcame horticultural prudence, and I made up my mind to allow the insects to run their course. By the end of August there was not a stalk in the double row of beans (which was 12 yards long) that was not black with aphides. The insects clustered especially on the topmost leaves, and among the flowers, and along the edges of the pods. The winged brood of the species appeared in the middle of September.

The number of familiars and foes that resorted to this colony of aphides was truly amazing. First there were the ants busy about their "milch cows"—as the old naturalists called them. It was amusing to see a cunning ant approach an aphis and caress her daintily till she—either indignant at the liberties taken with her, or tickled to death with the fun—ejected the precious drops that the ant was longing for—for the love of the ant for the Aphis is simply cupboard love.

At least four kinds of lady-birds employed themselves in lessening the numbers of the aphides:—The Thirteen spotted, Fig 33, (*Hippodamia tredecim-punctata* Linn,) the nine-spotted, Fig. 34, the beetle, fig. 35 larva, (*Cocinella novem-notata*, Kirby,) the five-

Fig. 33.

Fig. 34.

Fig. 35.

Fig. 36.

spotted, fig. 36, (much magnified,) (*C. quinque-notata*, Kirby,) and the two-spotted, (*Adalia bipunctata*, Linn.) The handsome larvæ of these species might be seen driving their snouts into the ill-fated aphides, and after a while casting them off "flaccid and drained." The coccinellidæ are among the gardener's most useful insect friends, but they are not always duly appreciated. A gentleman saw a gardener busily employed in picking off the Lady-birds from his plants and treading them under foot. "What are you doing that for?" he asked. "Well, sir," was the reply, "you see these nasty red things—them's the old uns; you see these little green things—them's the young uns just hatched. I'm killing the old uns fust, and I'll tackle the young uns arterwards."

Attracted, by the aphides, and the honey-dew which they ejected, innumerable two-winged flies buzzed daily about my beans. On one occasion I counted fifteen different sorts. Conspicuous amongst them were, *Eristalis tenax*, Linn, the Drone Fly (so called from its resemblance to the male of the honey bee); a pretty black and yellow Syrphus Fly, *Eristalis transversus*, Wiedeman; *Volucella erecta*, Walker, easily distinguished by the brown patch in its wings; *Tachina vivida*, Harris, a bustling showy insect with a large orange-red abdomen set with black bristles; the Flesh Fly, *Sarcophaga*

Fig. 37.

carnaria Linn, Fig. 37, (highly magnified,) large, red-eyed, with striped thorax and mottled abdomen—grey and black; the Green-bottle Fly, *Musca Cæsar*, Linn; the Blue-bottle Fly. *M. vomitoria* Linn, and a species of *Scatophaga*.

Less abundant as regards individuals, but more numerous in point of species were the Hymenopterous insects that frequented that row of beans. The following is a list of twenty different kinds of them captured during the month of September with the cyanide bottle only:

Ædynerus tigris, Saussure.
Philanthus bilunatus, Say.
Crabro singularis, Pack.
Monedula ventralis, Say.
Aphilanthrops frigidus, Smith.
Pompilus atrox, Dahlbom.
Hedychrum violaceum, Lepell.
Ichneumon comes, Cresson.
I. lætus, Brulle.
I. flavizonatus, Cress.
I. jucundus, Brulle.
I. creperus, Cress.
I. paratus, Say.
Trogus Copei, Cress.
Amblyteles indistinctus, Prov.
Opion purgatum, Say.
Opheletes glaucopterus, Linn.
Bassus leatatorius, Fab.
Pimpla pedalis, Cress.
Sampronota Americana. Cress.

A few words on

Internal Parasites.

The lowest types of these with which we are acquainted are the Gregarinidæ which are found in earth worms and other annulids. The gregarina of the earth-worm consists of a transparent capsule filled with a colorless, semi-fluid, granulated mass, in one part of which a well-defined nucleus appears. The creature has no digestive apparatus—it lives by absorption of fluids through the capsule. When two

Gregarinæ meet they adhere one to the other, and then surround themselves with a cyst. The partition between them disappears; the nuclei also disappear and then the case becomes filled with spindle-shaped bodies called "pseudonavicellæ," which in due time escape from the cyst into the surrounding medium. Their after history is not yet told.

It is said that when a gregarina finds itself left in a state of single blessedness it does not give itself over to despair, but proceeds to encyst itself, and to produce pseudonavicellæ on its own account.

The internal insect-parasites of insects are of two kinds: (1) Those that complete their metamorphoses within their victims; and (2) Those that leave their hosts on the completion of the larval stage.

Of the former, *Rhogus intermedius*, Cress, affords us an example. It assails the larvæ of *Apatela hastulifera* Abbot and Smith, which feeds upon the alder *Aldus incana*, Willdenow.

The parasitized Apatela larva may be found in the autumn attached to the leaves and stems of the plant. In them the ichneumon grubs, having attained their growth, form their thin, brown, closely-woven cocoons, which are arranged at an angle of about forty-five degrees, and usually in four rows. I have drawn out with a setting-needle no less than thirty-five pupæ from one caterpillar. They were all placed with the head upward. Very regular rows of round holes show how the adult ichneumons escape from their nurseries. As I have found the flies at large in the middle of October I presume that some of them, at any rate, pass the winter in the perfect state.

There are much larger insects that undergo all their changes within their hosts such as *Ophion macrurum*, Linn, Fig 38, in the Saturniadæ, *Opheletes glaucopterus*, Linn, in Cimbex. The eggs of these are laid singly or in pairs.

Fig. 38.

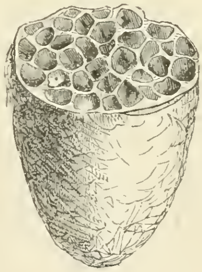

Fig. 39.

Of parasites that leave their hosts when full fed and before undergoing the pupal change *Apanteles longicornus*, Prov, is an example. The fluffy, yellow masses of the cocoons of this species may often be seen attached to the remains of noctuid larvæ, under the rails of fences, etc.

What entomological neophyte has not experienced the disappointment of finding, on a sudden, a carefully tended Sphinx caterpillar in a state of collapse, and bristling with the larvæ of some microgaster, that have extruded themselves from it, and that proceed to spin their cocoons about its remains.

But surely the most economical of all the internal insect parasites is the well-known *Cryptus extrematus*, Cress. The larvæ of this insect find themselves, they know not how, in the inside of a caterpillar of *Platysamia Cecropia*, Linn, and forthwith commence the herculean task of reversing the state of things in which they find themselves, and of environing their environment—putting the outside grub into their insides—beginning with the fatty portions of it. Numbers and perseverance accomplish the task, but not before the caterpillar has spun its wonderful cocoon. When this is finished the Cryptus larvæ, finding no more fat in preparation, hold a grand carnival on the vitals and frame of their host, and then spin their own cocoons within the snug winter quarters prepared by their unhappy victim. In them they lie through the winter as snugly packed, Fig. 39, as herrings in a barrel or sardines in a box.

Cannibals.

Among insect feeders upon insects the "Cannibals" must not be passed by. Of English caterpillars that have a bad reputation as such, *Thyatira derasa*, *Characlea Delphinii* and *Cosmia trapezina* are well-known examples. With *Mantis Carolina* Linn, the nuptial embrace has been known to end in the death grip, and the female to make a wedding breakfast of her spouse.

But the most startling story of all was told by J. F. Stephens, author of "Illustrations of British Entomology." He said that having turned the tail of a dragon-fly round to the head he saw the insect make a meal of four joints of its own abdomen. (See *Ent. Mag.* 1., p. 518). If this story had not come from so good a source, we should have thought it of like kind to that told of the Irishman, who, having disturbed a mud-turtle, "saw the baste swallow its own head."

There remains one other sort of devourers of insects that I wish to notice before concluding my paper—it is

Fungi.

We are accustomed to the idea of insects feeding upon vegetables, but that of vegetables feeding upon insects is not so familiar to us.

A fungus that has excited much interest amongst naturalists is the *Sphæria Robertsiana*, which grows in, and out from, the caterpillar of a New Zealand Ghost-moth, *Hepialus virescens.* This caterpillar undergoes its pupal change in the soil. But it often happens that a spore from the Sphæria finds a lodgment upon the body of a Hepialus caterpillar—usually between the head and the segment following—and, vegetating there, penetrates to the creature's inside. The animal contents of the caterpillar are by degrees exhausted by the fungus, and the skin—which retains its perfect form—becomes filled with vegetable tissues. At the same time one or more sprouts from the fungus rise through the soil, and into the open air. Fig 40. The sporules are formed round the top of this shoot, which is sometimes ten inches long. The parasitized larva is called by the Maories "Hotete." It is sought for by them and greedily eaten. It is said to have a nutty taste.

Fig. 40.

There is a fungus of somewhat similar habits that affects the larvæ of the May-beetle, *Lachnosterna fusca*, Fröhl. It is found at Quebec.

In my paper entitled "A Day in the Woods," published in the Society's twenty-first Report, I told of a fungus *Entomophtora grylli* var. *aulica*, Fres, that was destroying the caterpillars of Arctians of different kinds. This fungus is still destructive. It affects particularly the larvæ of *Leucarctia Acræa* Drury and *Spilosōma Virginica*, Fabr.

It may be that our meadows have been preserved from depredations, such as those described by Harris, under the head of "The Salt Marsh Caterpillar,"—("Insects Injurious to Vegetation," p. 351), by the agency of this fungus.

Time would fail to do justice to my theme—a volume might be written on every division of it; but I trust that I have said enough to awaken interest, and to stimulate research.

AN ATTACK OF EPHESTIA INTERPUNCTELLA.

By H A. Stevenson, London.

Attack.—Slender white or pinkish cylindrical caterpillars from one-half to three-quarter inches in length, with reddish-brown heads ; a dark brown stripe runs along the side. The caterpillars were found feeding on raisins, prunes, rice, currants, dried apples, and wherever found they could be traced by whitish silk threads or webs. The caterpillars, when full-grown, spin close whitish or greyish-white cocoons about a half-inch long and one-sixteenth of an inch in diameter. When the caterpillars emerge from the cocoons they are a narrow rolled-up-like moth, and are a brownish-grey color with a golden lustre. A more complete report of this insect is contained on page 77 of Mr. Fletcher's report in the Experimental Farm Reports for the year 1889.

On August 17th I was called to a wholesale warehouse in this city (London), where they said they were troubled for the last three days with a small moth, which was increasing very rapidly. When I went down there these small moths were flying all over the warehouse in great abundance, from the cellar to attic ; they were even on the outside of the front door, and they had originally started at the back door. I asked them where they came from, and they replied that they did not know where they came from, as the first were observed only three days before, so, after looking over the place I came across a shipment of Sultana raisins behind the back door and alongside the elevator. There were about 500 boxes, and the boxes were almost covered with the caterpillars and the moths. The moths were flying about in great abundance. A great number of the caterpillars had fallen down the elevator into the cellar, and some had also climbed up the supports of the elevator into the upper stories. The caterpillars had also penetrated into the adjoining rooms, and were swarming over the tea chests in great numbers —in fact, were into everything.

The raisins had been imported from Smyrna by Liverpool and Montreal, on October 20th, 1893, and had remained in the warehouse since then.

In three days from the time they were first noticed they had swarmed all over the warehouse.

Remedies.—I recommended that the raisins and the tea chests, which were swarming with the caterpillars and moths should be placed in some large boxes which were air-tight, and in which some bisulphide of carbon had been exposed in open dishes and left for a time. The moths and caterpillars on the tea chests soon fell off, as they had not penetrated into the interior. But the raisins were left over night in the boxes and the pests were soon destroyed. The firm tried spraying the place with the bisulphide, but it dissolved all the rubber atomizers used.

At night some bisulphide of carbon was exposed through the different parts of the warehouse, and the proprietor collected the keys from the different employees and cautioned them about the use of lights, as the bisulphide of carbon is very inflammable, and the whole warehouse was swept thoroughly through with a good stiff broom.

The raisins were unpacked and picked over and thoroughly cleaned and reboxed again as good as new. I have been in the warehouse several times since, and have not noticed the recurrence of the insect.

Thanks are due to Mr. Moffat, who at once identified the insect and compared it with the specimens in the Society's collection. And thanks are also due to Mr. J. Fletcher, of Ottawa, to whom specimens were sent, which he identified as Ephestia interpunctella, and also for his immediate reply concerning the destruction of the pest.

THE ECONOMIC VALUE OF PARASITISM.

By F. M. Webster.

In the term parasitism, as here used, is included the preying of one organism upon another, whereby the latter is largely kept within normal, numerical bounds, or is reduced to such conditions when it rises beyond them. Or, in other words, the preying of certain so-called beneficial insects upon others called destructive, and the action of fungoid growths upon such destructive species. Parasitism, in its broadest sense, has been aptly termed the balance wheel of nature, because of its similarity in effect to the mechanical contrivance bearing that name, which is instrumental in equalizing the irregularities of motion, in the machinery of which it is a part, and hence dependant upon the same source for its motive power.

The effect of vegetable devouring insects is to prevent the encroaching of one vegetable upon another, lest the latter should be exterminated: and the insect and fungoid enemies of such vegetable-feeding insects prey upon them in order that they do not themselves carry their work to such an extent as to exterminate the plant they are only designed to restrict. Thus we have a plant being fed upon by a species of insect, which insect is being kept from exterminating this plant by its own or primary parasites, and these in turn are kept from destroying all of the plant-feeding insects by still other parasites, known as secondary parasites, and these also have their parasites, known as tertiary parasites, and besides are more or less influenced by meteorological environment. To make the matter still clearer, it is as if a number of men were sent to prune an orchard, and a superintendent sent with them to see that the task was not over-done, he too, being amenable to still other authority.

Now, both plants and insects are capable of reproducing far beyond the number of young ordinarily required to keep these elements in equilibrium; but when, from any cause, one of them becomes abnormally reduced, this reserve reproductive force is brought into play, and the weakened element is thus soon able to regain its normal numerical power, but is restrained from going beyond. We thus have a huge piece of natural mechanism, self-regulating and self-adjusting, the balance wheel of which is parasitism.

Under perfectly natural conditions and uninfluenced by man, all of these natural organisms work in unison, as above indicated, and a temporary disarrangement of any one element, due to outside causes, such as the weather, is soon readjusted with little more disturbance to the others than would result to the Gulf of Mexico from the dropping of a pebble into the middle of the Atlantic ocean. In some cases a few plants might be killed throughout the local areas, but these would soon be replaced by others. But the husbandman now appears and upsets this equilibrium by destroying hundreds of species of plants over an area of millions of acres, and in their stead replacing but one. He causes a thousand apple trees to grow where nature intended but ten should exist. He causes the ground to produce a thousand grain plants, where nature intended but one to grow, and to produce seed far in excess of nature's requirements. The result is that the insect enemies of these cultivated plants, or such insects as can feed upon them, are greatly increased in numbers, because more of the young find a sufficient amount of food to develop them, and because they are needed by nature to counteract the influence of man. Later, the parasites, both primary, secondary and tertiary, increase for precisely similar reasons, and in obedience to the same laws, though, of course, they follow more or less distantly the movements of their hosts. From the fact that their movements do follow more or less distantly the ebb and flow of their respective hosts, the question of the economic importance of their influence has remained unsettled, and, by some, has even been doubted. When we come to consider that but an exceedingly small percentage of the movements of these insects ever reaches the eyes of even the most observing entomologist, and of the interactions of these organisms we really know but very little, it will be observed that to estimate the economic value of their influences is a very difficult task, if one expects to be just and secure the actual facts. A millionaire, in one of our larger cities, may replenish his purse at the bank each morning and go about among the poor, supplying to the needy a coat here, a pair of shoes there, a breakfast in one place and a supper in another; medicine for one sick mortal and medical attention for another; and go on in this way for years without being known outside of his own city, especially if he does not choose to advertise his generosity. But let him once fall into the clutches of a dissolute woman whom he may have, out of pity, befriended, and he will be publicly introduced from one side of the continent to the other, and the student of human nature will, indeed, have to be exceedingly guarded in his conclusions if he expects to get an unbiased estimate of this man's character, based only on the facts thus placed in his possession. Yet it seems to me that he is in as proper position to do so, as is even the working entomologist to pass upon the value of parasites in overcoming an invasion before more or less financial loss has accrued, basing his judgment upon the failures to do so that have come under his observation, and necessarily leaving what he does not see out of consideration. I do not believe anyone, be he ever so good an observer, can, within the space of one life time, collect data sufficient upon which to base the statement that "they usually appear in force only after the damage is done." Twenty years of close observation of insects, in the fields, leads me to make this statement; and I venture to say that in ninety-nine cases out of one hundred, an invasion of an injurious insect will attract the attention of an ordinary entomologist only when its parasites fail to overcome it before it has caused monetary loss. If the entomologist does not see them, how much more likely is the ordinary farmer to note these conflicts between parasites and hosts? It is the failures that usually first attract our attention, while the successes are more often unobserved, and, such being the case, how can we, with justice, weigh evidence we do not possess, and of the magnitude of which we can have little conception.

Now, I will give a few personal observations relative to this matter, which illustrate the fact that thousands of similar cases might pass unnoticed, even by those possessing fair abilities for seeing such things.

Ten years ago, in Indiana, I was studying wheat insects, and found the Wheat Midge larvæ, *Diplosis tritici*, exceedingly abundant in a number of fields; enough so to threaten serious injury to the crop. Soon after I observed these, considerable numbers of *Coccinellidæ* and *Telephoridæ* were running about over the heads of the wheat, thrusting their own heads down among the bracts, and feeding among the maggots of the *Diplosis*. Some of the *Telephoridæ* were venturesome enough to thrust their heads among the bracts in order to secure such of their prey as were exposed by the bending of the head as it swayed in the wind and were caught by the wheat head suddenly returning to an upright position, and if a breeze did not soon release them, paid the penalty of their temerity with their lives. Thousand of these carnivorous beetles were present, and they must have destroyed millions of the *Diplosis* larvæ, in the ten days to two weeks they were observed at work, and no perceivable injury resulted from the invasion of the midge.

A few years later a couple of coniferous trees on the campus of a western University were attacked by a scale insect, *Mytilaspis pinifoliæ*, if I recollect correctly, and by midsummer the leaves had a decidedly whitish tinge, as if sprayed with a dilute whitewash, and besides, took on a sickly look. In the meantime a colony of *Chilocorus bivulnerus*, or Twice Stabbed Lady Beetles, (Fig. 41), as they are commonly called, took up their abode on the trees, deposited their eggs and with the larvæ from these (Fig. 42) began to destroy the scales. All through the autumn the contest was waged, and with the coming of cold weather all the beetles, which had long before escaped from their pupa cases, went into winter quarters. With the coming of spring they were observed to return to the trees, and again began the contest in turn giving way to their larvæ, and these emerging as adults. In early summer the ends of the branches began to show leaves free from scales, and by the coming of winter again the outbreak of the pest had apparently been entirely overcome, and the fall rains washed off all vestige of the conquered hosts. The invasion had been overcome, and I doubt if another person besides myself had been aware of the two years' conflict.

Later, the maples along one of the principal residence avenues of Columbus, Ohio were threatened with an invasion of the Maple Bark Louse, *Pulvinaria innumerabilis* (Fig. 43), and the trees would certainly have been overrun the following year, had not this same Lady Beetle appeared in numbers, and with their larvæ so reduced the pest in numbers as to render injury impossible.

The appearance of the Grain Aphis, *Siphonophora avenae*, in such enormous numbers, during some seasons and the almost total absence of them during others, are matters of continued observation, but the causes therefor are not well understood. The present season, there was, quite early, indication of an outbreak of this species, but later it largely disappeared, while the cause for its doing so is obscure. Now, with all the light on the subject that I have been able to gain from several years' study of this insect, I am about convinced that the secret lies in the condition of the weather during spring; that

Fig. 41.

Fig. 42.

Fig. 43

cold, wet weather, at that season retards the development of their Hymenopterous parasites, by which they are largely held in check, but does not retard their own development to the same extent, thus giving them an advantage, early in the season, which is sometimes not overcome until much later and after the aphis has worked some injury. One other observation and I am done, though if space would allow, and time permitted me to go over my note books, I could multiply the number by at least fifty.

Late in April and early in May of the present year, there was considerable consternation among the farmers over a large portion of the State of Ohio, caused by the appearance of enormous numbers of the larvæ of the Clover Leaf Weevil, *Phytonomus punctatus*, in the clover fields. These larvæ were literally swarming and eating the plants to the ground, which, together with the drouth prevailing at the time over the northern portion of the State, gave matters anything but a favorable appearance, and it seemed that many fields could not escape ruin. In fact, an occasional farmer was frightened into plowing up his fields. But just here a fungous disease, *Entomophthora sphaerosperma*, Fresn., appeared and the effect was astounding. Farmers who had about given up all hope of a hay crop, wrote to say that the worms were all dead or dying and they could not find a live one. One farmer, who came in to consult me about breaking up his field, came a few days later to say that all the worms were dead or dying, and I found a close search was necessary to fine a healthy one of any size, and but few of even the youngest. Now, I do not believe a million dollars would cover the saving to the hay crop of Ohio, by this minute fungus, the present year. But this is not all. Soon after, rains occurred and the effect of the worms resulted only in retarding the blooming of the clover, precisely the effect of mowing or pasturing when done to prevent the depredations of the Clover-seed Midge, *Cecidomyia leguminicola*, and whether the result was the same or not, the farmers over the area covered by this Leaf Weevil, harvested a good crop of clover seed.

As previously stated, I do not even pretend to have observed a one-thousandth part of similar instances that have been going on in every locality each year. And I repeat again, it is the cases where parasites fail to overcome a destructive insect, before it occasions financial loss, that are the exceptional ones, and the nature of these failures is such that we see and recognize them far more readily then where the reverse is the case. It is the damage that we see, and this being the case, how can we see it before it exists? Not only this, but I believe the great fundamental principle involved in the use of insecticides is to assist parasites in doing their work; and as we get to applying them more and more intelligently, we shall watch for the exceptional cases where parasites are weak in numbers, and by artificial methods, seek to offer a substitute for the lack of numerical strength.

A RE-APPEARANCE OF PIERIS PROTODICE BOISD.

By J. Alston Moffat, London, Ont.

On the 18th day of October, 1894, I received a *P. protodice* from Mr. C. Anderson, a young collector of London, who has done some excellent work during the past summer, by sugaring in his father's garden. A few days previously he had called on me to say that he had seen on the street a white butterfly that was new to him. Failing to recognize his description of it, I showed him the drawer containing the *Pieris*, when he at once pointed to the female of *protodice* (see fig. 15) as like what he had seen. I gave him some information about the peculiar history of that butterfly which excited his interest, and he determined to make an effort to obtain some of them. With that end in view, he went on the 17th to a locality which he thought was the one most likely for them to be found in, with the result that he secured a pair of them, and when he showed them to me on the 18th they were yet alive. This is the first living pair of that butterfly that I have seen since the autumn of 1872, when *Pieris rapae*, the imported cabbage butterfly appeared on the stage to act its part, whilst the native one retired from view.

In 1887, Mr. S. H. Scudder, of Boston, published a most interesting account of the introduction and spread of *Pieris rapæ* from 1860, the year in which Mr. Couper captured a few specimens at Quebec, where it is supposed to have been landed, and the first reported to have been seen on this continent, to 1886, when it had reached the Rocky Mountains. This history of the introduction and spread of *P. rapæ* is full of interest and importance to the cultivators of some of the most valuable products of the field and garden; but the fact, that as the imported *rapae* advanced the native *protodice* disappeared, has ever seemed to me to be one of the most singular and interesting events in natural history that has come under my observation.

I have seen the statement made by various writers, that *Pieris oleracea*, also native, has disappeared from their locality on the advent of *rapæ*. This does not accord with my experience. *Oleracea* I always found to be confined to certain locations, periodical in its appearance and never very plentiful; and so it has continued to be. But *protodice* used to be more or less abundant every autumn until *rapæ* came, when it totally disappeared from my field of observation.

Mr. Scudder in tracing *rapæ's* gradual spread westward, says: "In 1873, as before stated, it reached Port Hope, and 'F. C. L.' reports taking his first specimen at Dunn in Haldimand county, Ontario, (Can. Ent. vi. 60), and some were taken at Hamilton (J. A. Moffat), where one would have looked for it the preceding year from its presence then at Toronto."

I have always felt quite certain that *rapæ* was present at Hamilton during the fall of 1872, although I did not notice it. My attention was arrested that season by the unusual abundance of cabbage butterflies, which I set down without examination as *protodice.* Not being informed about the advance of *rapæ*, I did not suspect its presence until the following winter, when upon a visit to Dundas I saw specimens of it in Mr. Kyle's collection which he had captured in his own garden the previous summer without suspecting that they were other than a variation of the native *protodice.* So that if I had examined closely, I have not the slightest doubt but I would have found *rapœ* helping to swell the numbers that so attracted my attention during the autumn collecting; confirming Mr. Scudder's expectations. Moreover, I found *rapæ* in the spring of 1873, indicating that it must have been present the previous fall. From that onward, I saw no more *protodice*, their place being taken by *rapœ.* And this I believe corresponds with the experience of Canadian collectors.

I have never seen this sudden and total disappearance of *Pieris protodice* satisfactorily accounted for. When I have seen the subject touched upon, it has usually been dismissed with a reference to "the struggle for existence and the survival of the fittest," which does not seem to me to apply in this case at all. The breeding habits of the two differ considerably; the native *protodice* was quite content to make use of the natural products of the soil for its purpose, whilst the imported *rapœ* attacks first, and in preference to all others the cultivated ones. So there need have been no "struggle" between the two on that point, as there was plenty for both, and as the larvæ of *rapœ* had an abundance of vegetable food to its liking, it would not devour that of the other even if it had met with it on the same plant. As that theory does not account for the disappearance of *protodice,* I have to look for one that will meet the requirements of the case.

It is a well-known principle in biology, that there are races of animals of the same species, that are possessed of different constitutions and dispositions, and that there are in nature, external influences at work which, acting upon the living organism will produce such differences. That in some instances, such differences manifest themselves geographically, and are spoken of as geologic and climatic, or as pertaining to the soil and climate. That races may differ in strength of constitution and character according to the part of the globe to which they belong. And that a strong race commingling with a feeble one, will impress its peculiarities upon the results of such a union and make its controlling power manifest.

Now it is generally admitted, that the life of Europe is of a more vigorous, tenacious and aggressive character than that indigenous to this continent; therefore I come to the conclusion that *protodice* and *rapæ* are but different races of the one species, and that when they met and commingled, the stronger constitution and proclivities of *rapœ* prevailed, and the outcome of the union were all stamped unmistakably *rapæ,* the characteristics of *protodice* being completely absorbed and obliterated. This seems to me to be quite sufficient to satisfactorily account for all that has occurred in connection with these two butterflies, and if it is correct then the probabality amounts almost to a certainty, that, sooner or later *protodice* will return. This is not a prophecy, but a simple deduction from the well-known laws of nature; for the external influences that produced the typical *protodice* and brought it into harmony with its environment at first are still at work, and working in the same direction. Therefore, when these external influences have had sufficient time to work their utmost upon *rapœ,* and no fresh importations take place, a reversion to the original type will be brought about as a matter of course.

In seasons of its greatest abundance, *protodice* never caused any serious injury to cabbage, in this northern portion of the continent at least. Its larva was quite content to feed upon the loose outside leaves of the plants, and so did but little harm; but the larvæ of *rapœ* will eat their way into the solid heart of the largest heads, injuring them greatly, if not ruining them utterly. If then *protodice* should return with its original disposition unimpaired and supplant *rapæ,* it will be a welcome transformation to the cultivators of that useful vegetable.

REMARKS ON THE STRUCTURE OF THE UNDEVELOPED WINGS OF THE SATURNIIDÆ.

By J. Alston Moffat.

I have had an opportunity of making further microscopical examination into the condition of the undeveloped wings of one of the large Saturniidæ.

During the winter of 1893 and 1894, I secured a large number of the cocoons of *Attacus promethea* and *Telea polyphemus.* In the early spring of 1894 I watched them closely, so as to secure, if possible, some of the moths on their escape from the cocoon, before expansion had commenced.

I was fortunate on being present at the moment of emergence of a fine large specimen of *T. polyphemus,* which I killed at once before growth had started. After removing the front winglet from its socket in the thorax, I found that the crimpling of the heavy nervures on the costal margin had relaxed, yet, even with that addition to its size, it measured only five-eighths of an inch in length and about three-eighths at its widest part; which might have expanded to three and a half inches in length, and one and a half at its widest part.

I did not discover anything new about the structure of the nervures, but I paid especial attention to them in relation to some suggestions that were made in connection with my former observations, to see how far they might be correct or otherwise.

One was, that the nervures might be constructed spirally, and that the extension of the membrane of the wing might be produced by, as it were, the relaxing of a compressed spring. I could see nothing to confirm such a view. The prominent rings of each segment made a complete circle. The extension of the nervure is in a straight line, something after the manner of the drawing out of a telescope, only, the one section not merely draws out of the other, but the small end of the one section draws out with it the inside of the large end, and keeps on extending until the nervure is all brought to a uniform thickness, with a slight reduction to the outer end.

It has been claimed by some, that the fluid enters the nervures and assists in the extension of the membrane. This, I am satisfied, is not the case. I examined the large nervures of an expanded wing, and found some parts of them hollow, and quite empty, which would not have been so if fluid had entered them. Moreover, the parts of the nervures where the segments unite seem to be solid, somewhat resembling the joints of a bamboo-cane, which would make the passing of the fluid through them almost, if not quite, impossible. My impression is, that the nervures do not in any measure contribute toward the extension of the wing, but depend for their own extension upon the pressure derived from the fluid flowing between the membranes.

The amount of fluid stored up in a newly emerged imago to be used in expanding the wing, must be very great. One of my *A. cecropia* in coming out of the cocoon, had in some way got a piece torn off a front winglet. Whilst expanding, fluid began to show at the break, and by the time the wing was fully extended, large drops hung all along the broken edge. This wing expanded as perfectly as the unbroken one; showing that there was enough fluid to do the work and some to spare.

I thought by maceration and manipulation to draw out the winglet to some extent; but was disappointed and not a little surprised to find that I could make little or no impression upon it in that direction. I afterwards thought that I discovered the reason of my failure.

I succeeded in cutting out a longitudinal section from between the heavy costal nervures of the winglet. Placing it on one of its cut edges under the microscope, I found that I had got a beautiful and intensely interesting object of contemplation. The gatherings of the membrane on the upper surface of the winglet, lay before me in a uniformly symmetrical row of elongated loops, with a row of tiny scales on the crest of each. The loops were nearly closed at their base, widest a little above their centre, making a narrow curve at their apex, open and quite empty. I looked for, and expected to find in the membrane of the underside, loops or gatherings, corresponding in some measure to those of the upper side, but could see none or anything resembling them. The membrane appeared only roughened and wrinkled. It was extremely thin and very frail, and the base of the loops seemed to be attached to its inner surface. The thought occurred to me that this would account for my inability to draw out the membrane of the winglet, and will in a measure explain the reason for the comparative slowness of their expansion as compared with butterflies. That is, supposing the wings of butterflies are constructed upon a different principle ; but this is a point which will require much more careful investigation than I have given to it.

The extent to which the fluid of the insect gives color to the scales is a very interesting subject for consideration. The fluid differs in color in different species. The color of the fluid decides the color of the membrane in the expanded wing ; but to what extent it affects the color of the scales is not so easily determined.

Prof. V. L. Kellogg, in his able and interesting paper, "The Taxonomic Value of the Scales of the Lepidoptera," which appeared in the Kansas University Quarterly, for July, 1894, on page 49 says : "The scales are attached to the wings by means of their short pedicels fitting into minute pouches or cups on the surface of the wing membrane. . . . The cups sink but slightly into the wing-membrane, the outer open end being at the surface of the membrane, and the inner closed end or bottom of the pocket, being only slightly below the surface. . . . Thus the cups are more truly little pockets on the surface of the wing, than pits or cavities in it." On page 50 he says : "The pedicels of the scales are of slightly varying shapes and of different lengths, corresponding with the pockets into which they fit. Those which enter insertion-cups which are expanded at the base, or at some point between the base and the mouth, present at the tip or between the tip and the point of merging into the blade of the scale, respectively, a slight expansion, so that they are pretty firmly held in the cup by a sort of ball and socket attachment."

These quotations convey no intimation that there is any opening at the top of the scale, or that the tip passes through the inner surface of the membrane, whereby the fluid could enter the scales whilst flowing between the upper and under membranes of the wings. And yet I think we have positive proof that in some instances the fluid does enter the scales and influences to some extent their color.

When commencing his description of the structure of scales, the Professor, on page 51, says : "The scales are flattened sacs, composed of two membranes, enclosing sometimes only air, sometimes pigment granules attached to the inner face of one of the membranes, and sometimes (as observed in cabinet specimens) the dry remains of what may have been during life an internal pulp." Here in a foot note, Prof. Kellogg refers to Minot and Burgess, who, in their description of the anatomy of *Aletia*, declare that in all of the scales examined by them there was always an internal pulp which contained coloring matter. Then on page 69 Prof. Kellogg states that : "The colors of scales are produced by two causes : (1) The presence of pigment ; (2) The overlapping, lamination and striation of the scales which produce those familiar but striking optical phenomena due to the interference of the waves of light. Combinations of these causes are usually present, so that the resulting color effects are practically incapable of analysis."

But there is a third cause of coloring. The long, slender scales on the winglets of a newly emerged *luna* are as pure a white as those upon the abdomen ; when the wings are expanded these same scales are tinged with yellow. Whence did they obtain it ? It is a well-known fact in the coloring of materials that a small quantity of green entering a pure white, a yellow is the natural result. Therefore the conclusion to me is irresistible, that a portion of the green fluid passing between the membranes of the expanding wings entered the scales—not enough to make them green, but sufficient to make them yellow. And there may be other lepidopterus insects which have the color of their scales modified in a similar way, but which will have to be detected by observing and comparing them in their unexpanded state with those on the expanded wing. The scales on an undeveloped wing are as much compressed, in proportion to their size, as the wing itself. As it requires the action of the fluid to expand the wing, the natural inference is, that similar causes are required to produce similar results in the scale ; but whether there is an opening in the scale corresponding to that at the base of the wing, to admit the fluid, or whether it enters by cell absorption, has yet to be demonstrated. In the great majority of cases the scales have their colors decided in the chrysalis, by internal pigments probably. What change takes place, if any, during expansion, I have not been able to ascertain, except a perceptible brightening of the colors.

After my paper was written I received from Mr. Balkwill a chrysalid of *D. archippus*, which had matured up to the point of emerging, then died before accomplishing it. I removed a winglet and proceeded to investigate. I failed to extend this winglet as completely as I did that of Polyphemus. It was much more elastic, and I could draw it out about half its own length, but it would go back again, and it was easier drawn out laterally than longitudinally. I found it impossible to remove the scales by any means at my disposal, and was becoming hopeless of seeing the structure of the membrane. I removed the costal nervure, and when examining the cut edge with a lens I perceived in one place that the edges of the membranes had parted. By many efforts and steady directing I succeeded in getting the point of a pin between them, when I found that the winglet was like an empty sac. The two membranes were not in the least attached ; even at the edges there was no pressure required to separate them, and the only thing that showed any symptom of holding them together was the fringes ; so I separated the two membranes clean from base to apex without an effort, when the whole structure of the winglet was exposed to view. The nervures are in the upper membrane, with a groove in the lower, opposite, into which they fit. Both membranes are structurally alike, but the gatherings are perceptibly finer in the lower as compared with the upper. The surface, under the microscope, presented the appearance of a multitude of light grey transverse lines with dark spaces between. The gray lines are the under edge of the gatherings, whilst the dark spaces are the openings into the loops, on the crest of which the scales are situated. The transverse lines are not solid lines, but seemed to be made up of minute elongated dots. Near the base of the winglet some of the lines had the appearance of being composed of wide-spread W's. Elsewhere the lines of the W's were erect and closely packed. This gives quite a different view of the wing structure from that obtained in my former observations of the upper surface of the membrane. Here we see all the material that is required for producing a wing two inches in length by one inch at its widest part, compressed into a space less than three-fourths of an inch long and three-eighths wide. We also see that there is nothing to prevent its rapid, or even instantaneous expansion when the fluid from the living insect enters between the membranes in sufficient quantity and force ; but that is required for the purpose, and nothing else seems capable of producing the wing extension ; but why the fluid does not escape at the edges I do not know, and yet all the butterflies that I have observed burst their chrysalis always let fall some drops of fluid, and it may be that this is whence they come, and which would also account for the general external moistness of the imago at that time.

But to return to a consideration of the moths. I am now convinced that there must be an actual growth of the lower membrane during the progress of their wing expansion. There is nothing in its structure resembling the gatherings observed in the lower membrane of this butterfly. There is an appearance of looseness in its texture, but it has none of the elasticity of the other ; it would tear rather then yield. Then again, when small moths are expanding their wings, the edges invariably curl under, as if the upper surface was extending more rapidly than the lower, which no doubt is the case, and is the cause of the curling, and as they press the two upper surfaces together it assists in extending the lower membrane and straightens out the curls. Here the question arises, are the wings of all moths constructed on the same principle? And are those of butterflies all constructed upon the other? The further one travels along such a road the greater appears the distance to the end.

BORDEAUX MIXTURE AS A DETERRENT AGAINST FLEA BEETLES.

By L. R. Jones, Burlington, Vt.

Bordeaux mixture is a remarkable compound. After many comparative tests, experimenters have decided that no other mixture or solution yet discovered is equal to it as a general fungicide. Furthermore, those who have studied its action upon plants are agreed that it exerts upon them some beneficial influence entirely apart from its fungicidal effects.*

So far as I know, however, Bordeaux mixture has never before been experimentally shown to have value as a remedy against insects. Some experiments in this line made at the Vermont Experiment Station during 1893 and 1894 will therefore have so general an interest that I present the results before this Society.

Potato plants in Vermont suffer from the attacks of the cucumber flea beetle (*Crepidodera Cucumeris*, Harris). I cannot estimate the amount of the damage to the entire potato crop of the State from these insects, but I am convinced that it is most serious, especially during a dry summer, such as we have just experienced. In confirmation, I will pass around for your inspection, some leaves taken from our experimental potato plot at Burlington. You will perceive that many of them are completely riddled with the small holes eaten by these flea beetles. These leaves do not exaggerate the condition of the entire plants in many portions of our field. Leaves punctured and even skeletonized, as some of these are, suffer much from the loss of so considerable a portion of their leaf tissue. Moreover, leaves thus mutilated are most disastrously exposed to the effects of drouth during dry weather, and to the inroads of fungi and other parasites during wet weather. Indeed, these secondary injuries follow so closely after the attacks of the flea beetle, and the beetles themselves are so small and shy, that the great majority of potato growers attribute the entire trouble to these secondary agencies.

Entomologists have tried many remedies against these flea beetles. The one commonly recommended by them for use on potatoes is the standard insecticide, Paris green, mixed with land plaster and dusted upon the plants. As will be seen from our results below this poison has been of comparatively slight value with us. Certain fungicidal compounds, however, proved of decided worth in our experiments of 1893. These fungicides were originally applied to check the fungous diseases to which potatoes in Vermont are especially liable. Noticing that these sprayed rows were less badly eaten by the flea beetles, a careful count was made of the number of holes in fifty leaflets from each row of one plot under treatment. The results were as follows :†

In 50 leaflets sprayed with....	very weak Bordeaux mixture,	1,794	holes
" " " "	ammoniacal copper carbonate,	1,587	"
" " " "	modified eau celeste,	1,376	"
" " " "	weak Bordeaux mixture,	1,295	"
" " " "	strong Bordeaux mixture,	1,194	"
" " " "	strong Bordeaux mixture and soap,	945	"

These plants had been sprayed but once, August 1st. The examination was made August 12th. From our observations during the present summer (1894), we are convinced that most of the holes in the leaves sprayed with Bordeaux mixture had been made before the plants were sprayed at all, *i.e.*, before August 1st. The present season observations upon these insects were begun earlier. The beetles were first seen about June 1st. By June 12th some of our early potatoes were badly eaten. This attack lasted but a short time, however, and during the latter part of June and first two weeks of July but few beetles were seen. Suddenly, about July 20th, they again appeared in large numbers, and during the next ten days did great damage to unprotected potato plants. Previous to this time portions of our plants had been sprayed with various fungicides, and all the plants sprayed with the stronger copper compounds, especially with the Bordeaux mixture, have remained practically free from the flea beetle injuries up to date.

*U. S. Dept. Agric., Div. Veg. Path., Bul. 7, p. 31.

It has been unusually dry with us, and in consequence our field is free from fungus troubles, yet the contrast between the sprayed and unsprayed rows is most striking. On the unsprayed rows every leaflet has from 50 to 500 flea beetle punctures, the plants are pale and sickly, and are already beginning to shrivel from the drought. The rows sprayed with Bordeaux mixture are practically free from the flea beetle mutilations, vigorous and thrifty. I have brought for your examination two entire potato plants taken from adjoining rows, the one sprayed with Bordeaux mixture, the other not, which fairly represents these differences. A few days ago two leaves were taken from each hill of these two rows and carefully examined. An average of twelve flea beetle punctures per leaflet was found on the row sprayed with Bordeaux mixture. On the adjoining row which had received no Bordeaux mixture, but had been freely dusted with Paris green (1 pound Paris green in 50 pounds land plaster) there was an average of 262 holes per leaflet.

We therefore feel justified in advising the use of Bordeaux mixture on potatoes for a new purpose, namely : As a deterrent against flea beetles. The use of Bordeaux mixture as a fungicide has proved especially profitable with us during wet seasons. This newly discovered virtue will warrant its use during the dryest seasons also, since the flea beetles are most troublesome then. Judging from our experience this season, in Vermont two applications of the mixture will suffice to hold these beetles in check, and upon late potatoes one application will probably prove sufficient. The first application should be made upon early potatoes during the first week of June, and another about July 15th. This latter application is also well timed for the prevention of the fungus diseases of the potato. Upon later potatoes the earlier application just mentioned is not necessary. We may, therefore, say that practical immunity from flea beetle injuries to potatoes may be secured at the cost of but a single application of Bordeaux mixture in addition to those already recommended for the fungus diseases.

Regarding the value of other fungicides tested, modified Eau Celeste has proved nearly as effective a deterrent against these beetles as has Bordeaux mixture. All of the other copper solutions tested have had similar deterrent effects roughly in proportion to the amounts of copper contained. The inference, therefore, is that the copper salt is the element especially distasteful to the beetles. Soap, when mixed with these fungicides adds slightly to their value as deterrents, but not enough to justify its addition for general use.

THE GYPSY MOTH (*Ocneria dispar*, L.).

By James Fletcher, Ottawa.

Of the many injurious insects introduced at various times from the old world, not one has, in as short a time, attracted so much attention, been so great a cause of anxiety, or been so systematically fought as the Gypsy moth, since it appeared in vast numbers in the State of Massachusetts in 1889. As a practical object lesson of the value of scientifically directed effort to overcome an insect enemy which had been allowed to increase unnoticed until it had assumed almost overwhelming proportions, the campaign which has been so successfully carried on for the last four years by the Gypsy Moth Department of the State Board of Agriculture of Massachusetts is of very great interest to all economic entomologists.

Having recently passed through part of the infested region, my attention was attracted to the trees bearing bands of burlap or marked with the various signs used by the inspectors to denote that they had examined the trees. Since my return to Canada, I have been favoured with a full series of the excellent reports of the Commission, together with much other information as to the methods of work, which have been kindly furnished by Prof. E. H. Forbush, the director of field work. On the whole, I think all must acknowledge that, up to the present time, the efforts of the Commission have been very successful ; but whether the enemy is entirely exterminated must depend upon whether the work is continued in the same careful manner for at least a few years longer.

†For further details see Vt. Exp. Sta., Bul. 40, p. 25.

Mr. L. O. Howard, the United States Entomologist, one of the best qualified to express an opinion, says, in his recent address as President of the Association of Economic Entomologists, as follows: "The work upon the Gypsy moth which has been done by the State of Massachusetts since 1889, is one of the most remarkable pieces of work, judging by results, which has yet been done in Economic Entomology. The operations have been carried on by a Committee of the State Board of Agriculture, and the means have been furnished by large appropriations by the State Legislature. Three hundred and twenty-five thousand dollars have already been appropriated. A territory comprising something over 100 square miles was infested by the insects, which occurred in such extraordinary numbers as to destroy many trees, and almost to threaten the ultimate extinction of living vegetation, not only within the infested territory, but in all localities to which it might spread. . . . . The infested territory has been reduced by one-half, and within the districts in which the Gypsy moth at present exists, it is, practically speaking, a comparatively rare species. The future of the insect is, however, problematical. The continuance of sufficiently large appropriations from the State Legislature to enable the work to be carried on, on its present scale, is doubtful, and yet those in charge believe that still larger appropriations are necessary to bring about extermination. They are confident, however, that with sufficient means, the insect can be absolutely exterminated from the State of Massachusetts."

It will be instructive to consider how it was that this pest became so numerous before it was noticed, what measures were taken to control it, and lastly, what can be learned from the efforts of the Commission.

Prof. C. H. Fernald, the eminent Entomologist of the State, and Prof. Forbush have given, in the reports, most careful accounts of the introduction, habits and best methods of fighting this pest. There seems to be little doubt that the species was introduced into America in 1868, by a Mr. L. Trouvelot, then living near Glenwood, Medford, Mass., where he was carrying on experiments with various caterpillars as producers of silk. Having brought from Europe a cluster of the eggs of the Gypsy moth, he took them out of the box and laid them on the sill of an open window, whence they were blown away and lost. From this centre the moth scattered in every direction until, in 1891, it was found to have spread, during the twenty-three years, over thirty townships.

The chief causes of its increase are the prolificness of the females, the hardiness of the species, and the fact that it feeds upon almost every plant wild or cultivated; the caterpillars also seem much less susceptible to injury from the ordinary poisonous insecticides than most of our native caterpillars and being an introduced insect, of which all the members of the present devastating hordes were derived from one nest of healthy eggs, the species is not attended by the natural parasites which in Europe keep, as a rule, its numbers within reasonable bounds.

It seems strange that so voracious a creature as the Gypsy moth caterpillar could have increased so largely as is described in several letters from correspondents which are published in the 1894 report, without having attracted sufficient notice for some one to have sent specimens to the official Entomologist of the State sooner than 1889. Mrs. Belcher, of Medford, Mass., writes: "Mr. Trouvelot, who is said to have introduced the Gypsy moth into this country, was a next door neighbour of ours. The caterpillars troubled us for six or eight years before they attained to their greatest destructiveness. This was in 1889. They were all over the outside of the house, as well as the trees. All the foliage was eaten off our trees, the apples being attacked first, and the pears next. They ate nearly every green thing in my yard, killing my rose bushes and doing much damage to the vegetables. No one who did not see them at that time, can form any idea of what a pest they were. We killed many with boiling hot water, and would then dig a hole and bury them so as to prevent a stench. Mr. Belcher was poisoned by them. While he was killing them upon the trees, they would get upon his neck and poison it. It was impossible to stay long in the garden, for they would crawl all over one. We fought them for two or three years before the Commission took hold. When they hatched out in the spring, our fence would be one living mass, and while they were small it was almost impossible to keep them off one's person."

Mr. J. P. Dill, of Medford, also gives a graphic account descriptive of the great numbers and annoyance due to this scourge: "The caterpillars first appeared in May and were at their worst in July. They ate all the leaves off the trees until it seemed as though fire had run through them, trees finally becoming as leafless as in midwinter. After eating the apple tree leaves, they completely stripped a Bartlett pear tree. We got no fruit from either the pear tree or the apple trees that year. That summer we could have got the caterpillars out of the holes in the trees by pecks. After the caterpillars had eaten all the leaves off the trees, they went down into the grass where they swarmed. When the plague was at its worst, that summer, I do not exaggerate when I say that there was not a place on the outside of the house, where you could put your hand without touching caterpillars. At the time the caterpillars were the thickest on the trees, we could plainly hear the noise of their nibbling at night. It sounded like the pattering of very fine rain drops. If we walked under the trees, we got nothing less than a shower bath of caterpillars, which spun down from the trees by hundreds, even when they were of large size."

There are several letters in the same tenor, bearing evidence to the enormous numbers of this pest at the time when the assistance of the State Entomologist was sought in 1889. We find that immediately following this, vigorous steps were taken to make known the gravity of the occurrence, and the Legislature was induced to make appropriations and appoint the Commission, which, by its energetic and successful efforts, has attracted the attention and admiration of the whole world.

Undoubtedly, one of the reasons that this insect made such headway without being noticed generally, was the culpable and unpardonable ignorance which prevails everywhere and in all countries, even among sensible people, concerning the habits of the injurious insects which yearly destroy such vast quantities of produce of all kinds. This ignorance on the part of the public is unpardonable, because it is in a large measure unnecessary; not only have efficient remedies been found out by officers paid by themselves through the State treasury, but the results of the work of these officials are in most cases at the disposal of anyone who will ask for them. Another reason that the pest did not sooner

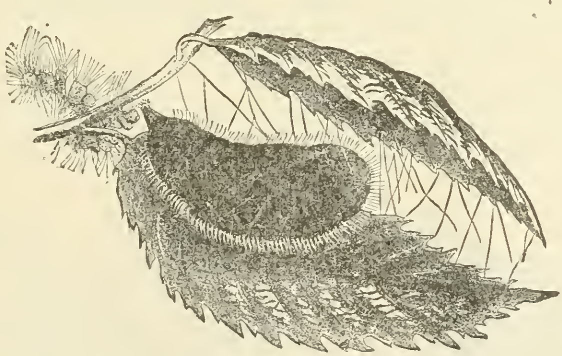

Fig. 44.—Gypsy moth, chrysalis.

attract attention, was probably that the caterpillars feed normally at night, and during the day hide in cracks and crevices of the bark, or rest on the trunks of trees, where by reason of their colouring they are not easily detected. It is only when their numbers become excessive and the food supply is diminished, that they feed at all times of the day and night, and wander from place to place. A feature of the work of the Commission has been the making known, as widely as possible, the appearance of this insect in all its stages. Not only were beautifully coloured plates published in all the reports, but show cases were made up and distributed to schools and public institutions, illustrating by actual specimens the appearance of the eggs, caterpillars, chrysalis, and perfect moths.

The eggs are laid from July to September in oval or rounded clusters, containing from four to five hundred eggs, covered with the yellowish hair from the body of the female. These clusters of eggs are placed indiscriminately on any object near to where the female emerges from the chrysalis (Fig. 44), on trees, fences, stone walls, etc. They are mostly laid about the middle of July, and do not hatch until the following spring. Both the egg-laying and the hatching of the young caterpillars are very irregular, so that the insect may be found active throughout the season. The caterpillars (Fig. 45), although extremely voracious, take a long time to complete their growth. When full-grown, they are nearly two inches in length, and although gaudily marked when examined closely, they are nevertheless inconspicuous when at rest on trees. "The general colour of the body is creamy white, thickly sprinkled with black. The ground colour shows in the dorsal and lateral lines which are somewhat broken. The tubercles on each side of the dorsal line from the second to the sixth inclusive are blue and give rise to short black

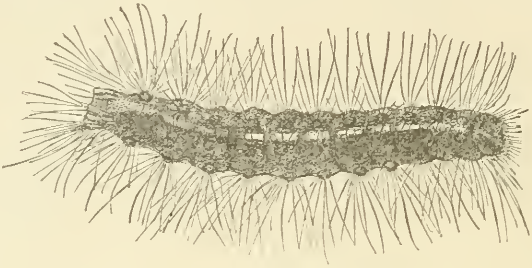

Fig. 45.—Gypsy moth, caterpillar.

spines. On each side of the remaining segments, except the last, the tubercles are dark crimson. On the top of the tenth and eleventh segments, on the dorsal line is a small cylindrical fleshy tubercle without hair or spines, the top of which is slightly inverted. It is uncertain what is the function of these organs, but it is quite possible they are scent organs."

"On the posterior edge of the last segment are four bluish-white tubercles giving rise to black spine-like hairs. The spiracles are oval, pale yellow, and encircled with black. The legs are dark crimson and the pro-legs flesh-coloured and streaked with reddish-brown."—(*Fernald.*)

There are other but less conspicuous markings, which it is not necessary to mention here. When full-grown, the caterpillars spin a small quantity of silk and change to the chrysalis condition. This usually occurs in July or August, and in Massachusetts the insect remains in this state from eight to twelve days.

Fig. 46.—Gypsy moth, male.

Fig. 47.—Gypsy moth, female.

The male (Fig. 46) and female (Fig. 47) moths are very dissimilar in appearance. The former measure from one and a half to two inches across the expanded wings. The ground colour of all the wings is brownish-yellow, varying in intensity in different examples. The head, thorax and antennæ are grayish-brown. The wings are crossed by about four waved black lines which are darkest on the costal edge of the wings. The terminal space is also darker than the rest of the wing, and the fringe is cut with dark brown between the veins. The males fly easily, in which they differ from the females, which can only fly down from an elevation.

The females are larger, varying from one and a half to two and a half inches between the tips of the wings; the entire body is white, except the abdomen beneath and the tip above, which are yellow. The markings on the fore wings are dark brown, or nearly black, but in some specimens are almost obliterated. The figures shown herewith have been kindly lent by Prof. Forbush, and give the general appearance of the markings of the two sexes, the chrysalis and the caterpillar.

The methods which have been adopted in the prosecution of such extensive operations as have been necessary, have been changed from time to time according to circumstances and experience, and many valuable data have been recorded which will be of great assistance for reference in future work. For carrying on this warfare, it was necessary to train all the inspectors and the many men required to cover the ground, and to attend to the many details connected with the destruction of the insect in its various stages, and the prevention of its spread into other districts. This involved an immense amount of careful work, which naturally took much time and money. A small hand-book, entitled "Laws, Rules and Regulations relating to the extermination of the Gypsy Moth," was printed for the use of the employees, giving a copy of the Act of 1891, authorizing the work, "Rules and Regulations for the Public," most complete "Rules and Regulations for the Agents" employed, and finally a very complete but concise account of the life history and habits of the Gypsy moth.

The methods employed were briefly as follows: The destruction of the egg was effected by saturating the clusters with creosote oil, dilute nitric and carbolic acids. For the caterpillars, trees were banded with burlap, which provided a hiding place in which they were afterwards destroyed; or a material called "raupenleim" or "insect lime," was placed upon the bands to prevent the caterpillars from climbing trees. Underbrush was cleared out wherever possible, and useless and hollow trees which would form hiding places, were cut down and burnt. Traps were also devised in which females were enclosed for the attraction of the males, which were successful. Wherever possible, shade trees, orchards and woodlands were sprayed with poisonous mixtures. As it was known that the moths were disseminated mainly by vehicles driving beneath trees in infested centres, efforts were made to inspect all vehicles going out of such districts and to clear thoroughly all trees along the roads. Great care seems to have been taken to obtain an accurate knowledge of the extent of the infested territory. Prof. Forbush, in his 1894 report, says: "The means, which though expensive, have given the best results and have finally exterminated the moth from localities and towns, consist of a thorough long-continued and repeated search by competent men, not only of all known infested localities, but of entire towns The moth is now so rare in most of the infested towns that it is only by such search that it can be found, and this search must be relied upon to assure extermination. When a colony is found, all forms of the moth must be destroyed; loose bark must be scraped from the trees, the undergrowth cut and burnt, all cavities which may serve for hiding places filled, and the locality carefully watched for at least two years."

Among the good results of this investigation is the discovery of the value of Arsenate of Lead as an insecticide. The experiments with insecticides made under Prof. Fernald's direction, prove that the arsenites as commonly used for spraying foliage are comparatively ineffectual against the Gypsy moth. It was found that the caterpillars will feed for days without apparent injury, upon trees which have been sprayed with Paris green or London purple, in a mixture so strong as to somewhat burn the leaves. In fact, the committee, in the spraying they are carrying on at present, have found it necessary to use arsenate of lead in as strong proportion as 10 pounds to 150 gallons of water. The great value of arsenate of lead is that it can be used freely upon foliage without danger of injury to the plant, as is the case with the generally used arsenites, Paris green and London purple. The greatest success in clearing the infested districts seems to have been secured by destroying the eggs late in the summer and in early fall, as soon as possible after they are deposited. If they are not disposed of at this time, some of the egg-clusters may be broken, and the eggs scattered by man, animals, or the elements. The treatment with acids is preferable to collecting, as there is less danger of breaking up the clusters and dropping the eggs. For the destruction of the caterpillars, Prof. Forbush reports that "the method of banding the trees with burlap is the most effective one yet devised to dispose of this form of the moth. The burlap offers them a convenient shelter, and if it is put on all infested trees, and frequently examined, many caterpillars will be caught that would otherwise escape notice. One hundred and fifty thousand yards of this material were purchased. It was cut into strips and applied to the trees in infested localities. It is necessary to examine the burlap bands once each day, or at least once in two days, to be sure of securing all the caterpillars which gather beneath them."

In view of the great difficulties which the commission had to face in solving the problem of the extermination of the Gypsy moth, the immensity of the work, the impossibility of forming a true estimate of the extent of the infested country or of the money required and, as it turned out, of the habits of the insects and the best remedies, too great credit cannot, I think, be given to those who have so wisely and ably directed the efforts to stamp out this dire enemy.

It will, indeed, be short-sighted policy, if the Legislature of Massachusetts does not now provide the funds necessary to finish up this good work. For nothing is more certain than that, if the amount estimated by the director with all the experience of the past three years, as absolutely necessary, be not forthcoming, not only will all the good work already accomplished be nullified, but at some time in the future it, and much more, will have to be done over again at a far greater expense. In concluding his last report, Prof. Forbush says: "The statute under which the committee is appointed, calls for extermination. The cost of extermination is great. It certainly costs more to search for the last egg-cluster, caterpillar or moth, than it would to destroy the majority of them and thus prevent both dissemination and damage for the time being. But if larger sums of money than those already appropriated can be secured and the extermination of the moth can be accomplished, an expense will be stopped, which must otherwise be continually increasing and which must be borne annually for an indefinite period, either by the State or by all residents of the country over which the moth would extend its constantly widening range. Encouraging progress towards extermination has already been made with manifestly insufficient funds and in the face of many obstacles. The numbers of the moth have been so reduced that no material damage has been done by it during the past two years. It has been exterminated first from single trees, then from orchards, woodlands and entire towns. More than 800 infested localities have been entirely freed of its presence. This work was begun on the borders of the infested region, and has progressed toward the centre until the moth appears now to have been exterminated from more than one-third of the region infested in 1891."

This was written in February, 1894. In Prof. Fernald's report, published in the same volume, are statements from six of our most prominent official entomologists, all of whom testify to the admirable way in which the work has been carried out. Prof. Packard says: "It seems to me that the work is practical and thorough throughout." Prof. Weed, of New Hampshire, says: "I have never seen a series of similar experiments carried on in so large a scale or in so thoroughly scientific a manner." Dr. Fernald, of Pennsylvania, says: "A careful consideration of the methods used and of the results already obtained, has convinced me that the extermination of the Gypsy Moth is not only possible but certain, if the work be prosecuted for a sufficient length of time." Prof. John B. Smith says: "The force has accomplished wonders, and I feel that there is very good reason for the belief that the Gypsy moth can be exterminated, provided the means are furnished." Dr. Lintner, of New York, says: "How a work of such magnitude, extending over so large a territory, could have been accomplished was a wonder and an enigma to me, until I became acquainted with the means by which it had been brought about."

THE SAN JOSÉ SCALE. (*Aspidiotus perniciosus*, Comstock).

By James Fletcher, Ottawa.

The unexpected discovery, in the Eastern United States and British Columbia, of this scourge of the Pacific Coast orchards, makes it all-important to draw the attention of Ontario fruit-growers to the subject, so that they may become familiar with its appearance and be prepared to adopt active measures to eradicate it, should it, as it is more than probable, appear in our province.

In August, 1893, the first eastern specimens of the San José scale were brought to the notice of the United States Entomologist, and he at once took active measures to find out all that was to be learned concerning its distribution and injuries, with the object of stamping out such a formidable enemy. In April, 1894, Mr. Howard issued a circular under the caption, "An Important Enemy to Fruit Trees," in which he gave a short history of the insect and the most approved remedies. He has been kind enough to lend Fig. 48 from that bulletin, which will be of great service in giving an idea of the appearance of the insect.

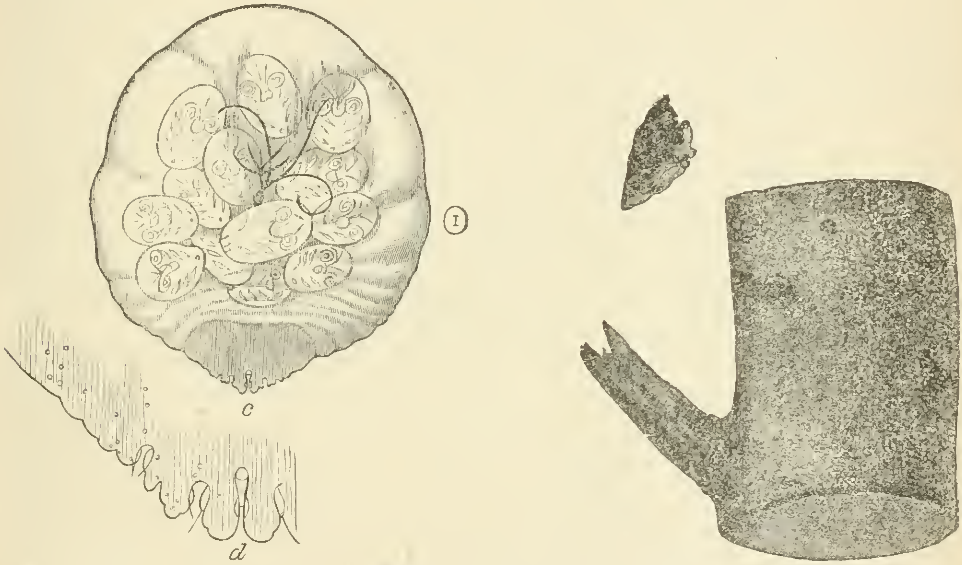

Fig. 48.—San Jose Scale, female enlarged and part of infested branch (life size).

The San José Scale was first brought to California it is thought, from Chile about 1870, and it was first noticed as injuriously abundant at San Jose in 1873, and called the San Jose Scale. "It does not seem to have been named scientifically until 1880, when Prof. Comstock described it in his annual report to the United States Department of Agriculture—he designated it *perniciosus*, because he considered it the most pernicious scale insect known in the country. It swarmed in countless numbers upon the trees in certain orchards, and infested all the deciduous fruits grown in California, except the apricot and Black Tartarian cherry. In the course of twelve years, the insect spread through all the fruit-growing regions of California, through Oregon, and into the State of Washington. It is known as the worst insect pest of deciduous fruit trees on the Pacific coast, and has caused great pecuniary loss. Many crops of fruit have been ruined, and thousands of trees have been killed." (L. O. Howard, Circular 3.)

In 1892 the insect was found in New Mexico on apple, pear, plum, peach, quince and rose. It had been brought into New Mexico upon young trees from California. Nearly all the other instances of infestation east of the Rocky Mountains can be traced to two nurseries in New Jersey, where the pest had been introduced in 1886 or 1887 on trees of the Japanese plum "Kelsey," which had been procured from the San Jose district in California. Idaho pear trees had also been frequently imported from California which were most probably infested. In 1891 and 1892 several blocks of young apple trees were badly infested. It is on pear trees chiefly that this pernicious scale has been distributed through the state of New Jersey. Prof. J. B. Smith says (Insect Life, VII., p. 166): "The Idaho pear has been the most dangerous because it came infested whenever imported direct, and after it came in close order, Madame von Siebold, Garber, Lawson, Seckel, Lawrence and Bartlett. Other varieties are also infested, but less frequently, and the scales do not do so well. Kieffers alone are absolutely exempt, and closely following comes the Leconte, which is rarely infested in the nursery, and never in the orchard, in my experience. One tree grafted with Lawson and Kieffer had the Lawson branch and fruit covered with scales, while the Kieffer branch was entirely free. Currants, black and red, became rapidly infested, and the scales were certainly distributed on these plants."

Mr. Howard says that this insect spreads rapidly for a scale insect, and is the most dangerous scale known. It is, too, inconspicuous and would be overlooked by many. Specimens of infested apple boughs received from British Columbia were entirely incrusted with the scales so as to give them the appearance of having been dusted with ashes. Mr. Howard gives the following description of the scale in his circular above referred to: "The San Jose Scale belongs to the same group of scale insects—the Diaspinæ, or armoured scales—to which the Oyster-shell Bark-louse of the apple belongs. It differs from this species, and in fact from all other eastern species found upon deciduous fruit trees, in that the scale is perfectly round, or at most very slightly elongated or irregular. It is flat, pressed close to the bark, resembles the bark of the twigs in colour, and when fully grown is about one-eighth of an inch in diameter. At or near the middle of each scale is a small, round, slightly-elongated, black point; or this point may sometimes appear yellowish. When occurring upon the bark of the twigs or leaves, and in large numbers, the scales lie close to each other, frequently overlapping, and are at such times difficult to distinguish without a magnifying glass. The general appearance which they present is of a grayish, very slightly roughened scurfy deposit.

The natural rich reddish colour of the limbs of the peach and apple is quite obscured when these trees are thickly infested, and they have then every appearance of being coated with lime or ashes. When the scales are crushed by scraping, a yellowish oily liquid will appear, resulting from the crushing of the soft yellow insects beneath the scales, and this will at once indicate to one who is not familiar with their appearance the existence of healthy living scales on the trees. During winter the insect is to be found in the half-grown or nearly full-grown condition. The young begin to hatch and to crawl from under the female scales shortly after the trees leaf out, and from this time through the summer there is a constant succession of generations. The insect affects not only the young twigs and limbs, and with young trees, the entire plant, but is also found upon the leaves and upon the fruit. When abundant, the fruit is destroyed. One of the most characteristic points in the appearance of the insect upon fruit, is the purple discoloration around the edge of each scale.

The above description will enable fruit-growers to recognize this enemy, should they be unfortunate enough to get their orchards infested with it.

Remedies.

With regard to remedies, we have the advantage of all the experience of Californian experimenters and the careful work of the Division of Entomology at Washington, as well as of Prof. J. B. Smith of New Jersey during the past year. There are three methods which have proved effective in fighting the San Jose Scale. In cases of severe attack it is recommended to cut down the infested trees and burn them. The other methods are, spraying with insecticidal washes, or fumigating the trees with poisonous gases. The insecticidal washes may be divided into summer washes, which can be applied while the trees are in leaf, and winter washes of a stronger nature, which would injure the foliage but will do no harm to the trees during the winter, when they are in a dormant condition, and yet will have the effect of destroying the scale insect. Of the *summer washes*, the ordinary kerosene emulsion (Riley-Hubbard formula) and a resin wash [resin 20 lbs., caustic soda (70 per cent. strength) 5 lbs., fish oil 3 pints, water 100 gallons] were recommended by Mr. Howard, and used with success during the past summer. On peach trees, owing to the susceptibility of the foliage to injury, the stock kerosene emulsion was diluted with fifteen times its volume of water, instead of nine times, the usual strength advised for most other plants. It was found advisable to repeat the sprayings at intervals of about a week. The young scale insects were noticed on May 19th at Riverside, Md., and the females, viviparous in habit, gave birth to young for a full month. This was upon peach trees, and it was found that the resin wash killed the scales more quickly than the very diluted kerosene emulsion, and, as Mr. Howard points out, this rapidity of the work is important, since where a full-grown female is sprayed with kerosene emulsion, she may live for three or four days, during which time she brings forth young; whereas if sprayed with the resin wash, fewer young scales are produced. The resin wash, however, is readily carried off by the rains, while the kerosene is more resistant.

In Professor J. B. Smith's investigations in Pennsylvania, it is recorded (Insect Life, VII, p. 159) that, "he has visited the locality at Atglen, Pa., and found that in an orchard of over 7,000 trees, all of certain varieties, and a few of others, were infested by the scale. As a result of his recommendations, kerosene emulsion has been applied three times to most of the trees at intervals of ten days, up to the first week in June. The treatment has been absolutely successful."

For *winter washes* the kerosene emulsion and resin washes may be made stronger. The stock kerosene emulsion has been used diluted with only four and a half parts of water, and for the resin wash the same ingredients were used in the following proportions: Resin, 30 lbs.; caustic soda, 9 lbs.; fish oil, 4½ pints; water, 100 gallons.

"The most favored winter remedy in California, however, is the lime, salt, and sulphur mixture. This consists of unslaked lime, 10 lbs.; sulphur, 5 lbs.; stock salt, 5 lbs.; water to make 15 gallons. This wash will do great damage to the trees if applied during the growing season, *and should be used only in winter.* All the sulphur and half the lime are placed in a kettle and 8½ gallons of water added, after which the contents of the kettle are boiled briskly for about an hour. The solution which at first is yellow from the sulphur, will turn very dark brown, assuming more or less of a reddish tint, and will finally change from a thick batter to a thoroughly liquid condition, the product being ordinary sulphide of lime. All the salt is added to the remaining 5 pounds of lime and the latter slaked, after which the slaked lime and salt are added to the sulphide of lime already obtained, the whole being then diluted with water to make 15 gallons. This should be strained before application, as it does not form a perfect liquid solution on account of the considerable quantity of undissolved lime, which will soon sink to the bottom unless the solution is constantly stirred while being sprayed."

The third method of fighting scale insects is known as the Gas Treatment. This has been extensively used in California but is an expensive operation, and the materials necessary are very poisonous and dangerous to have about. It consists, briefly, of covering the tree to be treated with an air-tight tent and then filling the tent with the poisonous fumes of hydrocyanic acid gas, which is generated by placing 1 oz. of cyanide of potassium, 1 fluid oz. of sulphuric acid, and 3 fluid oz. of water in an earthenware vessel beneath the tent. The gas is very light and rises to the top of the tent, and if this be kept on the tree for half an hour, every scale will be destroyed. The quantity of ingredients given above is sufficient for a tent enclosing 150 cubic feet.

What is wanted, however, is to know *the best remedy*, and it is satisfactory to learn that on the whole the standard remedy for scale insects, kerosene emulsion, is the best. In summing up his experience of the year, Mr. Howard says as follows: "Remedial work against this insect is onerous, but our experience has shown that three sprayings at intervals of ten days during the latter part of May and June, will practically destroy the insect, whether the spraying be conducted with very considerably diluted kerosene emulsion or with a resin wash, while during the winter a single application of either of the three winter washes will greatly reduce the numbers of the insect. Among the winter washes our experience leads us to give the preference to strong kerosene emulsion ; next, to the winter resin wash ; and finally, to the lime, salt, and sulphur mixture.

The kerosene emulsion is now well-known to most Canadian fruit-growers ; but it may be well to give it here.

Kerosene (coal oil)	2 gallons.
Common soap or whale oil soap	$\frac{1}{2}$ pound.
Water	1 gallon.

Cut up the soap and boil in the water till all is dissolved, then add it boiling hot to the coal oil; churn the whole briskly for five minutes with a syringe or force pump. When the emulsion is perfect, it will adhere without oiliness to the surface of glass, and when cooling forms a jelly-like mass, which can be kept indefinitely if stored in a cool place and covered from dust.

When required for use, for a summer wash dilute one part of the stock made as above with nine or fifteen parts of water. To make the stock dissolve easily, take first three parts of hot water to one of the emulsion, and then, when all is thoroughly mixed, add sufficient cold water to make the nine or fifteen parts required ; for a winter wash mix with four and a half or nine parts of water.

INJURIOUS FRUIT INSECTS OF THE YEAR 1894.

By J. Fletcher, Ottawa.

The season of 1894 has been a busy one for the practical entomologist. Not only have the usual complaints come in of injury by the canker worm, codling moth, curculio, cut worm, etc., but beside these there have been special developments of some well-known species, and some new invaders have appeared within our borders. Of these last the most notable are the Pear-tree Psylla, which occurred in large numbers in an orchard at Freeman, Ont., and the San Jose scale, of which undoubted specimens were sent in from British Columbia. The attention paid generally to the remedies advised by entomologists is decidedly much greater to-day than it has ever been before. This is largely due to the satisfactory results which have been obtained by new methods in treating insect enemies, and also by the even more remarkable successes of botanists in controlling fungous diseases. The combined application of fungicides and insecticides is still being carefully studied and the practice of adding Paris green or some other arsenite to the Bordeaux mixture for the treatment of fruit trees, has now been widely adopted by the best fruit-growers. The late action of the British Columbian Government in condemning and destroying shipments of fruits which on arrival were found to be infested by injurious insects illustrates the vigorous policy which has been adopted by the Provincial Board of Agriculture to protect their important fruit industry. This action will also doubtless have the effect of turning the attention of careless and improvident fruit-growers to the subject, and of inducing them to adopt the simple and cheap remedies which entomologists have been advocating for the last ten years and which must certainly result not only in increased wealth to themselves and the province, but gradually in reducing very materially the amount of injurious insect-presence in the Dominion.

The insect which was the cause of the condemnation of the shipments of apples in British Columbia, was the codling moth (Fig. 49 shews the work of the grub in the fruit) which, remarkable as it may seem, has not as yet been authentically recorded as breeding in British Columbia, although it is perhaps to-day the worst enemy of the apple in Eastern Ontario. If it be true that the codling moth is not already established in British Columbia, the wisdom of the Government of that Province in using every reasonable means of keeping it out, must commend itself to everybody.

Two of the worst enemies of the fruit grower are the codling moth (*Carpocapsa pomonella*) and the plum curculio (*Conotrachelus nenuphar*). [Fig. 50 represents all stages of the insect.] After a great many experiments under varying circumstances, spraying the trees with Paris green (one pound of Paris green, one pound of fresh lime and 200 gallons of water) still remains the best remedy; I believe that whether these insects are known to be present or not, it will well repay fruit growers to spray their orchards at least once every spring as a regular operation. Numerous instances have been reported to me of astonishingly successful results from following this course, and hardly any failures; so I can repeat what I said last year, that "where this work is done carefully and intelligently, it is practically all-sufficient." The occasional cases of failure which are sometimes heard of, and these are very rare, are almost invariably due to careless work. In the January number of the *Canadian Horticulturist*, I published an open letter requesting fruit-growers who had failed to obtain paying results from spraying plum or apple trees, to write to me on the subject After nearly a whole year, I have not

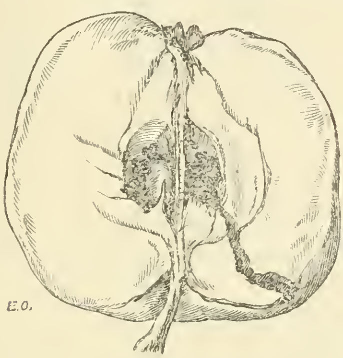
Fig. 49.—Codling moth larva in apple.

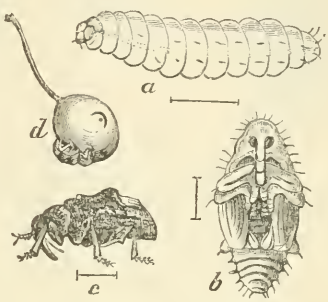

Fig. 50.—Plum curculio.

received a single unsatisfactory reply; furthermore, at the last annual meeting of the Fruit Growers' Association of Ontario, held at Peterboro', the question of spraying apple trees for the codling moth and plum trees for the curculio, came up for discussion. During this meeting which I had the pleasure of attending, I requested those present who had sprayed with Paris green against those insects, to give the results of their experience. Some convincing instances were given by leading members of the Association, which proved the efficacy of the treatment recommended.

Scale Insects.—Considerable injury is undoubtedly due throughout the whole Dominion to the operations of the inconspicuous but very pernicious scale insects; the most redoubtable of these is the Oyster-shell bark-louse (*Mytilaspis pomorum*, Bouche), and it competes every year with the codling moth for the honour of being the worst enemy of the apple tree. The life history, in this species as well as in most others, gives us a suggestion as to the best time to apply a remedy. The scales (Fig. 51) may be found upon the twigs and branches of apple trees, black currant bushes, mountain ash, ash and many other trees during the winter. From these during June emerge minute, white mite-like insects with six legs (Fig. 52), which for a few days crawl about the trees seeking for a suitable spot for them to attach themselves. This is generally on the young wood of the previous year. It is only during these few days that they are able to move, for having chosen a spot they pierce the bark with their needle-like beaks and remain fixed for the rest of their lives. Each gradually secretes a waxy mantle (Fig. 52, 3), and by August has transformed into a scale (Fig. 52, 7), in the case of the females, covering a cluster of eggs. The scales of the males are much smaller than those of the females and of a different shape. The eggs do not hatch until the following June. While the young are in the active state they are very much more susceptible to injury than after the scales are formed. The time of hatching varies somewhat in different localities, but by examining the trees this date can be easily ascertained, and if the trees are then sprayed with a diluted mixture of kerosene emulsion the insects will be destroyed. A good time also to spray the trees, is early in spring before the buds burst. It is a matter of surprise to some how these insects which pass their lives for the most part attached firmly to the bark can spread so rapidly through an orchard, as they frequently do. This has been explained by the suggestion that at the time the young lice first hatch, they are very active and crawl

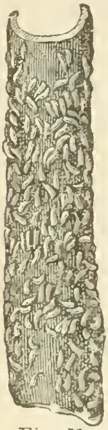

Fig. 51.

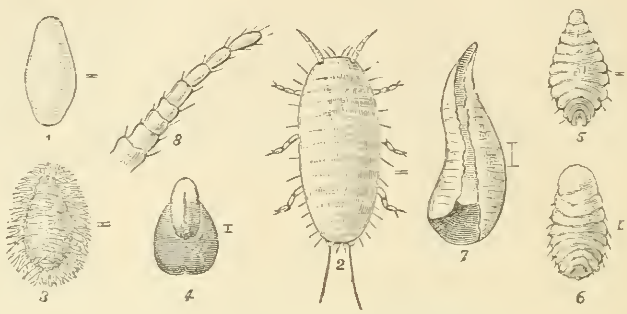

Fig. 52.—Oyster-shell Bark-louse.

with great agility. At this time of the year, the trees are much frequented by birds and other insects, upon which the lice crawl and are then carried from tree to tree by these larger winged creatures.

Belonging to this same class of scale insects, is the pernicious San Jose scale which on account of its importance, is treated of in a separate article.

Another enemy of fruit trees which has this year for the first time appeared in the Dominion, is the Pear-tree Flea louse, (*Psylla pyricola*, Forster), specimens of which were sent in from Freeman, Ont., by Mr J. S. Freeman, who writes : "I have a block of 300 dwarf Duchess pear trees mixed with apple trees, which are so badly affected with the insects which I am sending you, that from the appearance of the trees at present, the whole crop will be destroyed. I do not think that the pear trees have been troubled before this season. They are more or less over the pear trees of different kinds in my nine-acre orchard. From inquiries of other fruit-growers in this section, I think it likely that this pest occurs in other orchards too." At the time of receiving the specimens the insect was in the pupal form and just about to assume the perfect state. Mr. Freeman was written to as to the nature of the insect, and he was recommended to spray his trees with kerosene emulsion at the time and to repeat the application early next spring when the buds burst, that being the season when the young hatch from eggs laid by females which are now hibernating on the trees. This has been found to be the most successful treatment.

The Pear-tree Flea-louse belongs to the same class of insects as the aphids or plant lice, with which they form the second section of the *Homoptera*, known as *Dimera*, or those with two-jointed feet. In this section we find small insects with antennæ longer than the head and in the winged individuals four wings, ordinarily all of the same membraneous texture. The *Psyllidæ* or flea-lice are small insects found on leaves and in some species, as the Hackberry flea-louse, give rise to galls. They have long slender antennæ terminated by two bristles. The beak is short and tri-articulate, and the eyes are lateral and prominent as in the *Cicadae*. In fact, these little flea-lice, although seldom much more than one line in length, very much resemble *Cicadae* in miniature. On the front of the face are three ocelli placed in a triangle, the posterior ones quite close to the eyes. Unlike the *Aphides* or plant lice, the flea-lice have the power of leaping, from which they take their English name.

The Pear-tree Flea-louse is an introduced insect which was first recorded as injurious in America in 1833, according to Dr. Harris. It seems to be widely distributed in the Eastern United States and occasionally has developed into a serious pest. It has been treated of at various times by Dr. Lintner, Dr. J. B. Smith and the Washington Entomologists. The most important articles are those by Prof. Lintner in his Ninth Report and Prof. Slingerland in Bulletin 44, Cornell Univ. Agr. Exp. St., October, 1892, where a complete account is given of its life history and habits.

The presence of this insect is easily detected by the copious secretion of honey dew with which the leaves of the infested trees are covered and which soon becomes covered with the dirty looking black fungus (*Fumago salicina*),and also, after a time, by the falling of the foliage. The insect itself is about one-tenth of an inch in length, of reddish brown colour, with broad black bands across the abdomen, with transparent wings, the fore wings bearing one large vein which is divided into three forks, which again are bifurcated at the extremities. The immature insect, when first hatched, is a curious flattened oval creature, semi-translucent, yellow and very inconspicuous, only one-eightieth of an inch in length. It grows rapidly and in about a month passes through the five nymph stages, the last two of which are called the pupal stages and have black wing pads and blotches of the same colour on the body. Dr. Lintner records at least four broods during the season. An encouraging feature noticeable in all the accounts of this insect is the irregularity of its appearance, its occurrence in large numbers one year very seldom indicating that it will be as abundant the next.

Another very troublesome enemy of the fruit-grower is the Cigar Case-bearer of the apple (*Coleophora Fletcherella*, Fernald), which has been sent in from several places in Ontario and the Maritime Provinces. The first specimens were from Mr. Edwin Worden, of Oshawa, Ont., who in March sent twigs of apple trees thickly infested with the hibernating larvæ of the case-bearer, and the cocoons of the interesting little moth *Micropteryx pomivorella*, Pack. Specimens of the former came also from the Grimsby district, where it was stated that Greenings suffered most. Later in the year I had a visit from Mr. Harold Jones, of Maitland, Ont., who has suffered much from this small but very troublesome insect. He estimates his loss at fully the average fruit of one hundred trees. This has proved an extremely difficult insect to control. The life history is as follows:

The eggs are laid by the tiny moths during July. The young larvæ hatch in about a fortnight, and burrowing into the leaves, feed upon the parenchyma for a short time. They then cut out from both surfaces of the leaf oval pieces of the epidermis, with which they form their curious cases. Mr. Jones observed the young larvæ beneath the leaves about the 10th of August, and by the 1st of September they were clustered on the twigs. Here they remain all the winter with their curved cases, fastened securely to the twigs with white silk. As soon as the buds open in spring, they crawl out on the twigs and attack the unfolding leaves and flowers. As the leaves get larger, they confine themselves to the leaves, feeding chiefly on the undersides, where they bore a circular hole through the epidermis and extending their bodies into the cavity between the upper and lower surfaces, make large blotch-mines. They also do much harm by attacking the stems of the flowers and forming fruit. About the third week in June the larvæ crawl to the upper surface of the leaves, and, having fastened their cases down, change to pupæ inside them; the very small dark brown moths, a quarter of an inch in length, appearing from the second week to the end of July.

The remedy, which has been tried for this insect with the greatest success, is spraying with kerosene emulsion early in spring. Dr. Young, of Adolphustown, who suffered much from this insect, writes me on July 3rd last: "On the large block of Duchess apple trees, where we sprayed with Paris green in 1891 and '92, when the case-bearers were so numerous, there is now only an odd worm to be seen; but in other parts of the orchard, where they had scarcely reached at first, they were numerous this spring. The kerosene emulsion, either warm or cold, used in the winter had no effect; but when used cold in the spring, after the worms began to move about was very effectual. It more completely cleaned the trees of the case-bearers than did the Paris green. Still the Paris green did well, and took most of them off. We sprayed with both the same day." It is rather remarkable that this insect, in Nova Scotia and Prince Edward Island, attacks the plum and pear as well as the apple; but at Oshawa, Mr. Worden reports that, although he has plum and pear trees side by side with his apple trees, the latter alone are attacked.

An insect which has caused considerable damage to fruit growers is the Oblique-banded Leaf roller (*Cacœcia rosaceana*, Harris). Fig. 53 represents the moth with open wings; fig. 54, with wings closed; fig. 55, caterpillar and chrysalis. It is frequently a troublesome pest on apple trees and currant bushes. This year it was sent to me as an enemy of the birch, apple, pear, gooseberry, black currant, garden geranium, and a rare

Fig. 53.

Fig. 54.

Fig. 55.

Oblique-banded Leaf-roller.

interesting attack was noted in which it was destroying the seeds only of the silver maple. In fact this insect seems to be a pest upon a large number of shrubs and trees, upon any one of which it may develop injuriously under special circumstances. The general practice of spraying fruit trees with the arsenites, for the codling moth and the leaf-eating insects, will certainly reduce largely the occurrence of the Oblique-banded Leaf-roller.

The peach orchards in the Niagara district have, during the past two years, suffered seriously from the Peach Bark-beetle (*Phlœotribus liminaris*, Harris). Careful experiments have been begun in the extensive orchards of Mr. C. E. Fisher and Captain J. Sheppard, at Queenston; and it is hoped that before long a practical remedy will be discovered. It has usually been stated that this insect attacks only injured or dying trees; this, however, is certainly not the case, for it was found in perfectly healthy and thrifty young two-year-old peach trees; although very much more abundantly in older trees with rough bark. Its ravages are chiefly confined to the peach; but, at Queenston, specimens were found in both cherry and plum. There are at least two broods in the year. The perfect beetles hibernate in shallow galleries in the bark; they are active very early in the spring, and on warm days, even in February and March, come out of their burrows. Mr. Fisher wrote me on March 13th last: "I examined the trunks of the trees, as you suggested, on a sunshiny day, and found beetles crawling with their wings set for flying. As you know, ordinarily they do not appear as if they had wings; but these had them out ready for use. The presence of this insect is conspicuously evident in wet weather, when enormous quantities of gum ooze from the trunks and fall to the ground. The work of both the larvæ and the perfect beetles seems to be confined, at Queenston at any rate, to the bark. Not a single instance of penetration of the wood could be found, although this latter attack is recorded by some observers.

The remedies which have been tried are, washing the trunks with kerosene emulsion, linseed oil, and whitewash containing Paris green. The results have been rather conflicting, but there is every reason to think that before long a sure means of prevention will be found.

Another insect, which was received from the Queenston district, and also from Fenwick, Ont., is the Otiorhynchid beetle (*Anametis grisea*, Lec). Mr. Fisher found specimens upon his peach trees, but was under the impression they did not do him much harm. Mr. E. S. Atkins, of Fenwick, however, suffered more severely; he writes: "Last year they killed 130 young peach trees for me, and ate out four rows of strawberries extending across a six-acre field. They only attack the very first leaf-buds and the bark of the young trees when first set out; or when a young tree is budded and cut off near the ground, by eating the bud they destroy the tree. In many of their habits they resemble the potato beetle, such as letting themselves drop to the ground and lying apparently dead; and in warm sunny days they move about and eat, and on cold or wet ones they lie concealed at the root of the tree in the earth. When the beetles are most destructive, there is nothing to spray, as the top is cut off, and it is a mere switch with nothing to hold the mixture." As these beetles are wingless, and have to climb up the stems of trees to attack them, any mechanical means of prevention, such as a band of cotton batting or one of the various kinds of tree protectors, placed around the trunks at the time the perfect beetles occur, would prevent injury by the mature insects. In the case of young budded stock, a strip of tin bent into a ring about four inches in diameter, and pressed into the ground around the base of the stem, similar to those now so generally used by gardeners for cut-worms, might be serviceable.

I am informed by Dr. J. Hamilton that he has bred this beetle in Pennsylvania from the stems of the Rag-weed, *Ambrosia trifida*, where the larva had lived as a borer; but I think it must have some other larval habit in Canada, as this plant is only an accidental weed in a few places in Ontario.

The Spotted Paria (*Paria sexnotata*, Say,) is another beetle which requires mention as a serious pest of the raspberry. It has given great trouble on some of the fruit farms in the neighbourhood of Grimsby and St. Catharines for several years past. It was first brought to my notice by Mr. Martin Burrell, of St. Catharines, and was so difficult to control that he eventually ploughed out the whole of the infested patch. He wrote in 1892: "My old enemy, *P. sexnotata*, has revisited me this spring in greater numbers than ever. I sprayed with Paris green, 4 ounces to 30 gallons, but the foe still 'bobbed up serenely.' Of a quarter of an acre of my raspberries not a score of canes have leafed out. I am not the only victim this year, as several of my neighbours have been severely injured by the beetles."

Mr. John Craig, Horticulturist, of the Central Experimental Farm, found this insect also very abundant early in May, in raspberry plantations on the road between Hamilton and Grimsby; and Mr. Linus Woolverton, the energetic secretary of the Fruit Growers' Association of Ontario, sent me last spring specimens, with the report that they were doing much harm about Grimsby by eating out the fruit buds of raspberries, and thus destroying the crop. The following answer was sent to him: "The beetles you send are the Spotted Paria. This is a most injurious insect, and has done much damage in the way you describe, at St. Catharines. It seems to be very difficult to kill. I would suggest your dusting the raspberry bushes at once with Paris green and slaked lime, 1 pound of Paris green to 25 of lime. This mixture is easiest applied by putting it in a bag of cheese-cloth and shaking or tapping it over the bushes. Of course, if you can get a morning when there is a dew on them, so much the better. The beetles may also be killed in large numbers by beating or shaking them off the canes into an open pan containing water, with a little coal oil on the top. A good plan for collecting them is to hold an open and inverted umbrella beneath the canes when beating them, and then brush the insects out into the coal oil pan."

The Spotted Paria does not confine its attacks to the raspberry alone, but is occasionally troublesome to strawberries. In 1874, Mr. John McGrady, of Gatineau Point, Que., suffered a disastrous attack upon his strawberry beds. He found that hellebore was quite useless against the enemy; and my experience is that much stronger poisons are necessary for this beetle than for many others.

There have been, of course, many of the well-known fruit pests complained of from various parts of the province, but, with perhaps the exception of the Bud Moth in the Grimsby and London districts, and *Bucculatrix pomifoliella* in western Ontario, no others demand special mention here.

SIXTH ANNUAL MEETING OF THE ASSOCIATION OF ECONOMIC ENTOMOLOGISTS.*

The Association met at 10 a.m. in Room 12 of the Packer Institute, Brooklyn, N.Y., August 14th, 1894. The following officers and members were present:

President, L. O. Howard, Washington, D. C; Vice-President, J. B. Smith, New Brunswick, N.J.; Acting Secretary, C. L. Marlatt, Washington, D.C.

Messrs. William H. Ashmead, Washington, D.C.; Geo. F. Atkinson, Ithaca, N.Y.; Nathan Banks, Sea Cliff, N.Y.; D. W. Coquillett, Washington, D.C.; Geo. C Davis, Agricultural College. Mich.; A. D. Hopkins, Morgantown, W.Va.; Geo. H. Hudson, Plattsburg, N.Y.; J. A. Lintner, Albany, N.Y.; V. H. Lowe, Jamaica, N.Y.; F. W. Raine, Morgantown, W.Va.; William Saunders, Ottawa, Canada; E. B. Southwick, Central Park, New York City; F. A. Sirrine, Jamaica, N.Y. There were also in attendance upon the meetings visitors and members of other scientific societies, the average attendance being twenty-five persons.

The meeting was called to order by the President, and in the absence of the Secretary, Mr. Gillette, Mr. C. L. Marlatt was elected Secretary for the meeting.

The President, Mr. Howard, then delivered his annual address as follows:

A BRIEF ACCOUNT OF THE RISE AND PRESENT CONDITION OF OFFICIAL ECONOMIC ENTOMOLOGY.

By L. O. Howard, Washington, D. C.

When this Association was founded, in 1889, the name adopted was "The Association of Official Economic Entomologists," and its objects as outlined had evidently especial reference to the work of those economic entomologists who hold official positions. At the first annual meeting, held in Washington in November of the same year, Dr. Lintner, with the evident idea of broadening the scope of the Association, introduced an amendment to drop the word "official" from the title, and this amendment was adopted at the meeting at Champaign, Ill., the following year. Notwithstanding this fact, the membership of the Association is to-day largely official; out of 73 members 60 hold official positions, while the active work is all done by those with whom economic entomology is a means of subsistence. At the last meeting, held in Madison, Wis., in August, 1893, every member registered belonged to the official class.

The organization meeting at Toronto on the 30th of August, 1889, presented a strange contrast to this. It was held, as may not generally be known, upon a wooded knoll at a landing called Scarborough Heights, overlooking the waters of Lake Ontario. The beach below and the woods around were being scoured by industrious collectors of the old section F, of the American Association for the Advancement of Science. Professor Cook, who presided, occupied a dignified position astride a fallen log. Dr. Smith, who acted as secretary, had climbed with difficulty to the top of a tall stump and took his minutes on his knee. Dr. Bethune, Mr. Fletcher, Mr. E Baynes Reed, Mr. H. H. Lyman, Prof. C. W. Hargitt, Mr. E. P. Thompson, and the writer reclined with more or less grace, according to their physical conformation, upon the ground or sat cross-legged upon convenient ant-hills This group, which made the Association "official" in name, was composed of four official entomologists and five who were simply interested workers.

*Through the kindness of Mr. L. O. Howard, Entomologist of the Department of Agriculture, Washington, D.C., and Mr. C. L. Marlatt, Acting Secretary of the meeting, who prepared an abstract of the proceedings for the *Canadian Entomologist*, we are enabled to give the following account of this interesting meeting as well as some of the papers in full.—Ed.

This brief historical paragraph is introduced for the purpose of showing the interesting paradox that this Association was originally made official by non-officials, that it was subsequently made non-official by officials, and that since it was made non-official it has become more official than before.

It is in part for this reason that I have chosen to bring together for presentation at this meeting some account of the rise and present condition of official economic entomology, but more largely for the other reasons that few of us probably have been able to take a comprehensive view of the status of our application of entomology the world over, and that a review of what has been done can not but justify our existence as a class and as an association and afford the strongest of arguments for the increase of our numbers and for increase of means and facilities.

The ravages of insects on cultivated plants were doubtless coetaneous with the beginning of the cultivation of plants. Thus a necessity for economic entomologists existed at a very early time. The condition of the ancient husbandman with reference to injurious insects is voiced by the prophet Joel, when he says:

> That which the palmer-worm hath left, hath the locust eaten; and that which the locust hath left hath the canker-worm eaten; and that which the canker-worm hath left hath the caterpillar eaten. * * * He hath laid my vine waste and barked my fig tree; he hath made it clean bare and cast it away; the branches thereof are made white. * * * The field is wasted, the land mourneth. * * * Be ye ashamed, O, ye husbandmen; howl, O, ye vinedressers, for the wheat and for the barley, because the harvest of the field is perished.

In 1881 Dr. Hagen published in the columns of the *New Yorker Belletristiches Journal* (August 16) an interesting article entitled "Heuschrecken-Kommissionen im Mittelalter und heute," in which he showed that grasshopper invasions have taken place since time immemorial, and that man's efforts to combat them have always ended in his discomfiture. It is not surprising, therefore, says Dr. Hagen, that the helpless multitude called on the intervention of the law and of God to deliver them from such pests; and the legislators on one side and the priests on the other were forced to carry out the will of the people. But since written laws and legislative decrees against elemental plagues would have been ridiculous without a surrounding of imposing, legally regulated forms, the development of these formalities gradually reached a high degree of perfection. Legislation for defense against injurious animals reached its highest development in the Middle Ages. Legal procedures against all sorts of noxious animals were frequent, and the famous Burgundian legal light, Bartholomæus Chassanæus, wrote a book setting forth the rules according to which a suit against grasshoppers should be entered. After a court had been called together by written request, a judge was appointed and two lawyers were elected, one to plead the cause of the people and one the cause of the accused grasshoppers. The former commenced by formulating the charge, and concluded by requesting that the grasshoppers be burned. The defendant's lawyer replied that such a request was illegal before the grasshoppers had been requested in due form to leave the country. When, however, they had not left the country after a stated term, they could be excommunicated. Many years afterward, another jurist, Hiob Ludolph, wrote a pamphlet antagonizing Chassanæus's work, setting forth the lamentable legal ignorance displayed by the latter. The accused grasshoppers, said Ludolph, must be summoned four times before the court, and if they do not appear, then they should be dragged by force before the court. Then only can the suit proceed. Other interested parties, however, shall be heard, namely, the birds that feed on the grasshoppers. Further, it would be a great injustice to banish the grasshoppers into adjacent territories. Finally, the code proposed by Chassanæus can never be brought into accordance with the laws and rules of the Church, because there is absolutely nothing in those laws about suits against grasshoppers.

Several suits against injurious insects were brought before the courts, and the rulings have been preserved. In one case (1479) a suit was brought against injurious worms, apparently cut-worms, in the canton of Berne, Switzerland. The worms, although ably defended, lost the suit, and were excommunicated by the archbishop and banished. Regarding the effect of this awful punishment, the chronicler who relates the story adds: "No effect whatever resulted, evidently on account of the great depravity of the people."

In various other law suits the chroniclers fail to mention the final outcome; but, says Hagen, it is safe to surmise that in the whole history of jurisprudence there was never a greater disregard for the rulings of the courts on the part of the guilty parties than during the time of the mediæval insect commissions.

To attempt to enumerate the different commissions which have been established, particularly by European countries, against particular outbreaks of injurious insects, and especially against locusts, which have entered Europe from the south and from the west at intervals for many hundreds of years, would be impossible, and even if possible, would extend this paper far beyond its proper length. I shall be obliged, therefore, to neglect this phase of the subject and confine myself rather to the history of the more prominent organizations of wider scope, and these I shall treat geographically and chronologically, beginning with our own country.

The United States.

Massachusetts. Dr. Thaddeus William Harris was probably the first American entomologist to receive public compensation for his labors, and in this sense he may be called the first of the official entomologists in this country. In 1831 he prepared a catalogue of insects, appended to Hitchcock's Massachusetts Geological Report. "In the condition of American science at that day," says Scudder, "it was a work of inestimable value, though his only material compensation was one copy of the report and several copies of the appendix." At a later period he was appointed by the State as one of a commission for a more thorough geological and botanical survey. In this capacity he prepared his now classic report on insects injurious to vegetation, first published in full in 1841, the portion upon beetles having appeared in 1838. He reprinted the work under the name "Treatise" instead of "Report" in 1842, and again, in revised form, in 1852. The whole sum received by him from the State for this labor was $175. After his death the work was reprinted by the State in its present beautiful form, with wood engravings which themselves marked an epoch in that art. It is largely upon this work that Harris's scientific reputation will rest, and, although prepared more than half a century ago, it is to-day perhaps above all other works the *vade mecum* of the working entomologist who resides in the northeastern section of the country,

From 1852 to 1870 Massachusetts did little or nothing in economic entomology. In the latter year, however, Dr. A. S. Packard, jr., then of Salem, was appointed entomologist to the State Board of Agriculture—without compensation, however, as he informs me. Dr. Packard published three reports covering the years 1871, 1872 and 1873. They were short pamphlets, but were ably prepared, and were undoubtedly productive of very considerable good.

With the founding of the State Agricultural Experiment Station under the Hatch Act, Prof. C. H. Fernald, professor of zoology at the Massachusetts Agricultural College at Amherst, was appointed entomologist to the station. Prof. Fernald's work has been practically like that of most other station entomologists, and he has published several important bulletins. The ones for which there has been the greatest demand are No. 5 on household pests, which was the outgrowth of original studies which Prof. Fernald had made in this direction, and No. 12 containing the work upon the bud moth, spittle insects, and several other injurious species, all based upon original observation. The most important portion of his work has not yet been published. It comprehends the scientific results of his observations as entomological adviser to the gypsy moth committee of the State board of agriculture. That these results will prove of great value the writer is in full position to assert, as he has had the pleasure of seeing many of Prof. Fernald's experiments in the course of procedure, and has been greatly impressed by the ability and care with which they are being carried on. Prof. Fernald has also for some years held the position of entomologist to the State Board of Agriculture.

The work upon the gypsy moth, by the way, which has been done by the State of Massachusetts since 1889 is one of the most remarkable pieces of work, judging by results, which has yet been done in economic entomology. The operations have been carried on by a committee of the State Board of Agriculture and the means have been furnished by large annual appropriations by the State legislature. Three hundred and twenty-five thousand dollars have already been appropriated. A territory comprising something over 100 square miles was infested by the insect, which occurred in such extraordinary numbers as to destroy many trees and almost to threaten the ultimate extinction of living vegetation, not only within the infested territory, but in all localities to which it might spread. It is unnecessary to detail the steps by which relief was brought about. Mistakes were undoubtedly made at first, and it is to the work of the present committee that the main credit is due. The infested territory has been reduced by one-half, and within the districts in which the gypsy moth at present exists it is, practically speaking, a comparatively rare species. The future of the insect is, however problematical. The continuance of sufficiently large appropriations from the State legislature to enable the work to be carried on on its present scale is doubtful, yet those in charge believe that still larger appropriations are necessary to bring about extermination. They are confident, however, that with sufficient means the insect can be absolutely exterminated from the State of Massachusetts. With the legislature disinclined to continue the large appropriations, the methods of the committtee at present pursued will have to be seriously altered. Given a small appropriation of say $25,000 annually, it will become necessary to adopt some law, like that in force in California, whereby much less frequent inspection may be made, and the committee will have to rely in part upon voluntary observers for information. Moreover, they will be unable to conduct spraying operations upon a large scale, and the expense of the destruction of insects will have to be assessed upon the owners of the property upon which the insects are found, provided such owners will not themselves undertake the destruction of the insects. There will be many disadvantages from such a course, and in the case of unproductive lands the expense will be so great that the owner will prefer confiscation. Between some such course as this and the continuance of the present methods, however, there seems to be little choice, since if the appropriation were taken away the insect will not only speedily reach its former destructive height, but will spread far and wide over the country. It may be urged that it will be only a few years before the insect will take its place as a naturalized member of our fauna and will become subject to the same variations of increase and decrease as our native species, and that it will, in fact, become little more to be feared than species already existing with us, particularly if its European natural enemies are introduced. Against this view, however, it must be urged that the gypsy moth seems an exceptionally hardy species and that even in Europe it is a prime pest. The caterpillar is tough and rugged and seems little subject to disease and to climatic drawbacks and is wonderfully resistant to the action of ordinary insecticides. The gypsy moth larva will feed for days without apparent injury upon trees which have been sprayed with Paris green or London purple in a solution so strong as to somewhat burn the leaves. In fact, the committee, in the spraying which they are carrying on at present, have found it necessary to use arsenate of lead in as strong proportion as 10 pounds to 150 gallons of water. The well-known vitality of previously introduced European injurious insects is apparently increased to a striking degree with this species, while the fact that it feeds on nearly all plants renders it a much more serious pest than any of its forerunners. Under these circumstances, therefore, any course other than an energetic and well-directed effort to keep the insect within its present boundary will be shortsighted in the extreme, although it is very doubtful to my mind whether absolute extermination will or can ever be brought about.

NEW YORK. It is rather a stretch of the facts to classify Dr. Harris as an official entomologist. The first scientific man to receive a true official commission for the investigation of injurious insects was Dr. Asa Fitch, of New York. The New York State legislature, during the season of 1853-54, made an appropriation of $1,000 for an examination of insects, especially of those injurious to vegetation, and authorized the appointment of a suitable person to perform the work. The matter was placed in the hands of the New York State Agricultural Society, and at a meeting of the executive committee of the society, held at the Astor House, in New York City, May 4, 1854, the following resolution was passed:

Resolved, That Asa Fitch, M.D., of Washington County, be appointed to perform the work: that he be furnished with such accommodations as he may desire in the rooms appointed for the laboratory in charge of the society; and that the president and Mr. Johnson, the corresponding secretary, be a committee to prepare instructions for such entomological examinations.

Mr. William Kelly, at that time president of the New York State Agricultural Society, and Mr. B. F. Johnson, its corresponding secretary, performed their duties in the preparation of these instructions in the most admirable manner. In fact, so well were they performed that we imagine Dr. Fitch himself may have drafted the report which was signed by these gentlemen. So far as we are aware, no subsequent appointment of an official entomologist has ever been accompanied by such a full, explicit, and able paper, and for this reason we quote it in full :

As our State has had a thorough examination made of all branches of its natural history except its insects, it is of the highest importance that the remaining branch—not less in importance than the others—should receive attention. The committee feel assured that in the selection of Dr. Fitch they have secured a person every way competent to discharge the duties imposed in a manner creditable to the society and the State.

In carrying out this examination it is desirable that equal prominence be given to economical as well as to scientific entomology, that being the part of this science which is specially important to the community at large. It has been objected to the volumes of the Natural History of the State that they are too purely scientific in their character to be of special value to the great mass of our citizens, and in the work now to be performed it is obvious that it will be of very little consequence to know that a particular kind of moth or fly is an inhabitant of this State unless we are also informed of its history and habits, and whether it is a depredator upon any substance which is of value to man The habits and instincts of our insects are a proper subject of inquiry as much as their names and marks by which they are distinguished from each other. The whole history of every noxious species should at least be traced out as fully as circumstances will permit.

The examiner is therefore directed, in the first place, to make for the present season the insects which infest our fruit trees the leading object of examination. Those infesting our forest trees, our grain and other crops, our garden vegetables, our animals, etc., will remain to be studied hereafter. The examiner is desired in his examinations to search out every insect which is a depredator upon our apple, plum, pear, cherry, peach and other fruit trees, and study out all the facts in the history of each species, both in its larva and in its perfect state, as far as he shall have opportunity to do so. In this way a broad foundation will be laid, to which additions can be made which future observations may show to be necessary.

Should any important insect depredator appear the present season in any other situation than upon the fruit trees, the opportunity for studying it should not be neglected, for the same species may not appear again in many years under circumstances as favorable for becoming acquainted with its real history.

Secondly, what time is not necessarily occupied in examining the insects infesting our fruit trees should be devoted to collecting and classifying the insects of the State, and to naming and describing such species as have not been described.

A report to be prepared at the end of the season, to be submitted to the legislature, showing what has been accomplished during the season, to be divided into two parts. The first, upon economical entomology, giving an account of all that has been ascertained respecting the insects infesting our fruit trees, and any other injurious species that may have been obtained. The second, upon scientific entomology, giving a systematically arranged catalogue of all the insects of the State, so far as they are known, with a brief description of such new and undescribed as may be discovered.

The work should be pursued with a view of eventually securing to the State as full and complete accounts of all the insects of this State as far as to place this important science (which is at the present so greatly in the background, and so partially and imperfectly explored on this side of the Atlantic) in as perfect a position and as favorable a situation for being acquired as its nature will admit of. Should there be time, in addition to the above, to perform other labor, it is desired :

Thirdly, that a commencement should be made in writing out full descriptions of the species pertaining to some particular order, with observations upon the time of appearing, habits, etc., with a view of future publication, so as to secure a complete account of all the insects of the State pertaining to that order.

Lastly, suits of specimens to fully illustrate both the economical and scientific entomology of the State should be gathered in connection with the other parts of this work, to be placed in the Cabinet of Natural History ; and in the Agricultural Museum specimens of the wood, leaves and fruits ; and other substances depredated upon by each and every species of our noxious insects, showing the galls or other excrescences which they occasion, the holes or burrows which they excavate, the webs or other coverings for themselves which they construct, with preserved specimens of the worms, caterpillars, etc., by which each of these deformities is produced.

Such further examination as Dr. Fitch may deem necessary to carry out fully the objects desired to be accomplished, as from time to time may be deemed advisable, the committee desire may be made.

William Kelly,
B. F. Johnson,
Committee.

Dr. Fitch, while not officially designated as State entomologist of New York, was always given this title by courtesy, and continued in office until 1871 or 1872, when his fourteenth report was published, and when the infirmites of age affected him to such an extent that he could no longer continue his investigations. The reports were published in the Transactions of the State Agricultural Society from 1854 to 1870, skipping the years 1859, 1865 and 1868. The first eleven have been published separately, as well as in the transactions of the society. In 1873, through an appropriation by the State legislature, provision was made for the revision and republication of the reports, and the revision was completed by Dr. Fitch. The resolution for printing, however, failed of the concurrence of the senate, and since that time the manuscript has been lost.

The value of Dr. Fitch's labors has been very great. In his fourteen reports the great majority of the injurious insects of the State of New York received more or less detailed consideration, and in the majority of cases the life histories of the insects treated were worked out with great care and detail. The remedial measures suggested by Dr. Fitch have, however, been largely improved upon, and the practical value of these reports to day rests almost entirely upon the life-history side.

From the time of the publication of Dr. Fitch's last report, in 1872, the State of New York did nothing for the encouragement of economic entomology until 1881, when the legislature, on April 14, passed an act to provide for the appointment of a state entomologist. The law reads as follows :

No. 316.] SENATE OF NEW YORK,

In Senate, April 14, 1881.

Introduced by Mr. Fowler ; read twice and referred to the committee on finance ; reported favorably from said committee and committed to the committee of the whole.

AN ACT to provide for the appointment of a state entomologist and fixing his compensation.

The people of the State of New York, represented in Senate and Assembly do enact as follows :

SECTION 1. There shall be appointed, by the governor, a state entomologist, who shall be charged with the study of insects injurious to agriculture and of methods for controlling and preventing their depredations.

P. 2. The salary of the entomologist shall be two thousand dollars, and he shall render an annual report of his labors and investigations to the legislature and shall arrange for the state museum of natural history a collection of insects taken in the course of his investigations.

P. 3. This act shall take effect immediately.

(Senate No. 316). (I. 520, G. O. 391).

(Chap. 377 of the Laws of 1881. Passed May 26, 1881, three-fifths being present.)

The movement which resulted in the passing of this law was started by the regents of the University of the State of New York at their annual meeting in 1877, and the person appointed to fill the office was Dr. J. A. Lintner, a well-known worker in entomology, who, up to that time, had been connected with the State Laboratory of Natural History. Dr. Lintner has held office continuously since 1881. He brought to bear upon his duties a ripe experience and a mind trained in scientific methods. He has published nine reports, the last one covering the year 1892, and only recently distributed. These reports are in many respects models. The great care and thoroughness of the author have hardly been equalled by any other writer upon economic entomology. The form of the reports is most admirable, and the account of each insect forms almost invariably a complete compendium of our knowledge concerning it down to the date of publication. His accounts are also arranged in the most convenient form for reference, a full bibliography precedes the consideration of each species, and the frequent subheadings enable the most practical use of the report. The reports are replete with sound and ingenious practical suggestions, and are written in a straightforward, simple style, which possesses great literary merit. They abound in illustrations, and are made available by most complete indices and tables of contents. Aside from these reports, Dr. Lintner has published a great deal in the newspapers, particularly the "Country Gentleman," on the subject of economic entomology, and another valuable feature of his reports is the comprehensive list which he publishes each year of his unofficial writings.

The Cornell University Agricultural Experiment Station was established by the authorities of the university in 1879, and its first annual report contained a series of miscellaneous entomological observations by the acting professor of entomology Dr. W. S. Barnard. The second report, issued in 1883, contained an elaborate monograph of the Diaspinæ by Prof. J. H. Comstock, and an important article on the Tineidæ infesting apple trees by Mr. A. E. Brunn, a student of the Department of Entomology. With the establishment of the agricultural experiment stations under the Hatch bill, in 1888, this experiment station became governmental in its character, and Prof. Comstock was naturally made entomologist. Since that date he, or his assistants, have published a number of very important bulletins, the first one, on "A Sawfly Borer of Wheat," by Prof. Comstock; the second on Wireworms, by Prof. Comstock and his assistant, Mr. M. V. Slingerland, and the later ones mainly by Mr. Slingerland. These are among the best and most practical of the experiment station bulletins that we have. They are characterized by almost a superabundance of detail and plainly by great care. The illustrations are very nearly all original, and are excellent.

THE U. S. DEPARTMENT OF AGRICULTURE. Almost simultaneously with the appointment of Dr. Fitch to do entomological work for the State of New York, came the appointment of an entomological expert under the General Government. On June 14, 1854, Mr. Townend Glover was appointed by the Commissioner of Patents to collect statistics and other information on seeds, fruits and insects in the United States, under the Bureau of Agriculture of the Patent Office. Mr. Glover was one of the most eccentric individuals who have ever done important work on North America insects. He had led a roving and eventful life as a boy in Brazil, as a clerk in a draper's shop in England, as an artist in Germany, as a roving traveller and naturalist in all parts of the United States, and finally as a landed proprietor with horticultural tastes on the banks of the Hudson in New York. Pomological interests brought him to Washington shortly before the time when he received his appointment. His first report was published in the Report of the Commissioner of Patents for 1854, was illustrated by six plates engraved on stone by the author and comprised some consideration of the insects injurious to the cotton plant, wheat, and the grapevine, and on the plum curculio, codling moth, and peach borer, closing with some account of the more common species of beneficial insects. His second report, in 1855, continued the consideration of the cotton insects, together with some accounts of orange insects. The reports for 1856 and 1857 contained nothing from him, but that for 1858 contains a rather full report on the insects frequenting orange trees in Florida, published over the initials D. J. B., which were those of the then chief clerk of the Bureau, with whom Mr. Glover had many serious disagreements, largely on the matter of credit, which resulted in his resignation the following year. In 1862 the Department of Agriculture was established as a separate institution, under the commissionership of the Hon. Isaac Newton, and in 1863 Mr. Glover was appointed entomologist to the Department. His annual reports follow consecutively from 1863 to 1877, and are storehouses of interesting and important facts which are too little used by the working entomologist of to-day. Their value for ready reference, however, is detracted from by a lack of systematic arrangement and poor paper and presswork, but many observations are to be found in the pages written by Glover which have subsequently been announced by others as original and important discoveries. There is, however, in Mr. Glover's reports, a lack of consecutive and full treatment of any one topic, and the subject of remedies seems seldom to have received original treatment or thought with him. This is largely due to the fact that his reports were matters of secondary importance to him, his main energies being devoted to the building up of a museum for the Department and to the preparation of his most elaborate series of illustrations of North American insects, a work upon which he expended enormous labor, and which unfortunately, up to the present time, has added to his fame nothing but the good opinion of a few of his scientific contemporaries

In 1877 Mr. Glover's health suddenly failed him. His report for that year was largely prepared by his able assistant, Mr. Charles Richards Dodge, who, by the way, is the author of the charmingly written account of Mr. Glover's life, published as Bulletin 18 of the Division of Entomology of the Department of Agriculture. Mr. Glover lived for several years afterwards, but was unable to do further work. He died in Baltimore in 1883, and the writer and Profs. Uhler and Riley were the only entomologists present at the funeral services of this, in many respects, remarkable man.

The year 1878 marked a new era in the governmental entomological work. Prof. C. V. Riley, a comparatively young man, who had already become famous by the admirable work which he had done as entomologist of the State of Missouri, and as chief of the

U. S. Entomological Commission, was that year appointed successor to Mr. Glover by the Hon. William G. Le Duc, then Commissioner of Agriculture. Prof. Riley took hold of his work with his accustomed vigor, and, during the nine months that he remained in office at that time, accomplished a great deal. His report for the year 1878, though short, is by far the most practical one which the Department had published up to that time. On account of a misunderstanding with the Commissioner, Prof Riley resigned his commission in May, 1879, and Prof J. H. Comstock, of Cornell University, was appointed in his stead. Prof. Comstock remained in office until May, 1881 He completed the investigation of the cotton worm, begun by Prof. Riley, and published a thoroughly practical and useful volume entitled "Report upon Cotton Insects," early in 1880. In addition to this report he published extensive annual reports covering the years 1879 and 1880, which rival in thoroughness and practicality the Missouri reports of Prof. Riley and those which were issued by the Department after his resignation. The report for 1880 is marked by the publication of the results of a preliminary investigation of the insects affecting the orange, and more especially by an elaborate report upon scale insects, which formed the basis of the study of this important and very destructive group of insects in this country. Upon the change of administration in 1881, Prof. Comstock was retired, with a year's commission as investigator, and Prof. Riley resumed charge of the governmental entomological work. From that time until June, 1894, Prof. Riley remained consecutively in office. The work which he has accomplished has been of the highest order, and has been largely instrumental in placing the science of economic entomology in this country upon its present sound footing. During the course of his administration of the office he has published 12 annual reports, 31 bulletins, 2 special reports, 6 volumes of the periodical bulletin "Insect Life," and a large number of circulars of information. He has developed not only the scientific side of the work, but also the practical side. Under his direction advances have been made both in insecticides and insecticide machinery, which are of the most far-reaching importance. The earlier work of Prof. Riley will be mentioned in another place, but it will be appropriate to state here that no other name in the annals of North American economic entomology stands out with the same prominence as his. His work has been called epoch making, and this expression may be considered justified. His voluntary resignation at this time would be greatly to be deplored, were it not for the fact that, with the restoration of his health, which is confidently to be anticipated, he will resume his labors—in another capacity, it is true, but along entomological lines and with undiminished vigor.

Aside from the work of the Division of Entomology, the General Government has, upon one occasion only, provided for work in economic entomology, as have so many other governments, by the appointment of a special commission. The U. S. Entomological Commission was founded, by authorization of an act of Congress approved March 3, 1877, specifically to report upon the depredations of the Rocky Mountain locust in the Western States and Territories and the best practical methods of preventing its recurrence, or guarding against its invasions. The commission was attached to the U. S. Geological and Geographical Survey of the Territories under the charge of Prof. F. V. Hayden, and the office of chief was filled by the appointment of Prof. C. V. Riley by the Hon. Carl Schurz, then Secretary of the Interior. The other members of the commission, also appointed by the honorable Secretary of the Interior, upon consultation with Prof. Riley, were Dr. A. S. Packard, jr., of Massachusetts, secretary, and Prof. Cyrus Thomas, of Illinois. The commission remained in existence, supported by annual appropriations by Congress of varying amounts, until 1881. It published 5 reports and 7 bulletins. The first two of the annual reports related to the Rocky Mountain locust and allied migratory locusts, and form together probably the most complete monograph of any one insect ever published. The practical end was kept constantly in view, and the reports are thoroughly practical, as well as thoroughly scientific. In the appropriations for the year 1879 the commission was instructed to report upon cotton insects, and the results of the investigation thus brought about are published in the fourth report of the commission on the cotton worm and boll worm—another elaborate volume which cannot be too highly praised from all standpoints. The third report treats of a variety of topics and includes two important monographs, one upon the army worm and the other upon canker worms, while the fifth report contains a full and comparatively exhaustive treatment of the subject of the insects injurious to forest and shade trees. The first, second and third reports are published under the joint authorship of the three commissioners, the fourth under the sole authorship of Prof. Riley, and the fifth under the sole authorship of Dr. Packard.

ILLINOIS. During the regular session of the legislature of Illinois, in the winter of 1866-'67, a law was passed enacting that a State entomologist shall, "by and with the consent of the senate, be appointed by the governor with a salary of $2,000 per annum, for a period of two years, or until his successor is appointed and qualified." This legislation was the result of a petition from the State Horticultural Society, and on May 21, 1867, the society passed the following resolution:

> That the president of the society be authorized to engage B. D. Walsh to immediately commence entomological investigations in relation to horticulture, and be empowered to pay out for that purpose a sum not exceeding $500 from the legislative appropriation. This action is taken in case of failure to appoint.

At a special session of the legislature held in June, 1867, the governor sent in the name of Mr. Walsh for confirmation, but the senate postponed action upon it until the next regular biennial session in the winter of 1868-'69. Hence it follows that Mr. Walsh's first and only report was published as acting State entomologist, his untimely death occuring before his second report was prepared, its preparation having been delayed by a long period of ill-health which preceded the railway accident which was the immediate cause of his demise. Mr. Walsh was a retired farmer and lumber dealer of English university training, who for a number of years prior to his appointment had been industriously studying entomology and had written largely for the agricultural press upon the subject of injurious insects. Although not a naturalist by training, his work showed extraordinary powers of observation, and his published writings, as well as the statements of his contemporaries. indicate that he possessed a remarkable mind. In this connection, however, we have occasion to speak only of his official work as indicated in his one report. In this report, which is now unfortunately very rare, he treated particularly of the insects affecting the grape, the apple and the plum, and to this added, under the head of "Insects affecting garden crops generally," a chapter on the so-called "hateful grasshopper," or migratory locust, (*Caloptenus spretus*). His treatment of the other insects is very thorough and his work in a large part remains standard to-day.

Mr. Walsh s successor, Dr. William LeBaron, a practising physician of Geneva, Ill., well known for his writings on injurious insects in the agricultural journals of the time, and an able and conscientious entomologist, published four reports as appendices to the Transactions of the State Horticultural Society, from 1871 to 1874. The first three treated of miscellaneous insects, mainly those injurious to fruit and fruit-trees, while his fourth report, and part of his third, consisted of the beginnings of a work entitled Outlines of Entomology, of which he completed only the order Coleoptera. This portion however, was executed in the most scientific manner, and was fully illustrated, largely by original drawings by Prof. Riley. It has since been used to some extent in the class room, and has undoubtedly been the means of interesting many students in the subject of entomology. Dr. LeBaron's treatment of insects from the economic standpoint was careful and practical. He records in his first report the first successful experiment in the transportation of parasites of an injurious species from one locality to another, and in his second report recommended the use of Paris green against the canker-worm on apple trees, the legitimate outcome from which has been the extensive use of the same substance against the codling moth, which may safely be called one of the great discoveries in economic entomology of late years.

Dr. LeBaron died in harness, I believe, and was succeeded in office by the Rev. Cyrus Thomas, of Carbondale, who published a series of six reports, extending over the years 1875 to 1880. Mr. Thomas at the time of his appointment was a well-known entomologist, who had written extensively for the "Prairie Farmer" and other agricultural newspapers on the subject of economic entomology, and who had published an elaborate monograph of the Acridiidæ of the United States as one of the special volumes of the Hayden survey of the Territories. He started with his first report, a manual of economic entomology for the State of Illinois, including in this report the portion relating to the Coleoptera. In his second report his assistant, Mr. G. H. French, treated of the Lepidoptera, and in his third report Mr. Thomas treated the Hemiptera, monographing the Aphididæ. His fourth report included a consideration of one family of the Orthoptera, namely, the Acridiidæ, and the fifth a paper on the larvæ of Lepidoptera, by his assistant, Mr. D. W. Coquillet, while in his sixth he was obliged, from the force of circumstances to abandon the scheme. The manual of economic entomology of Illinois remains, therefore, unfinished. In the course of the six reports a very large number of insects are treated from the economic standpoint. Mr. Thomas was able to employ several excellent assistants, and the six reports as a whole are very creditable to the State. The last of the six reports shows rather plainly the falling off in Mr. Thomas's interests in the subject of entomology. Its publication was coincident with the close of the work of the U. S. Entomological Commission, and it consists entirely of reports by Mr. D. W. Coquillett and Prof. G. H. French. After its publication Mr. Thomas transferred his labors to the field of ethnology, in which he had long been interested, and he is at the present time one of the able workers in the U. S. Bureau of Ethnology.

Upon Mr. Thomas's withdrawal from office, Prof. S. A. Forbes, director of the State Laboratory of Natural History, at Normal, Illinois, was appointed State entomologist, his commission dating July 3, 1882. Prof. Forbes's attention had for some time been more or less engaged by questions relating to economic entomology. He has held office continuously since that time, and has published six reports, the first one covering the remainder of the year 1882, the second the year 1883, the third the year 1884, the fourth the years 1885 and 1886, the fifth the years 1887 and 1888, and the sixth the years 1889 and 1890. Prof. Forbes's reports are among the best which have been published. They are characterized by extreme care and by an originality of treatment which has seldom been equalled. The practical end is the one which he has kept mainly in view. His experiments with the arsenites against the codling moth and the plum curculio were the first careful scientific experiments in this direction which were made, and his investigations of the bacterial diseases of insects have placed him in the front rank of investigators in this line. His monographic treatment of the insects affecting the strawberry plant is a model of its kind, and the same may be said of his work upon the corn bill-bugs and of his studies of the chinch bug. In fact, whatever insect or group of insects has been the subject of his investigations, he has attacked the problem in a thoroughly original and eminently scientific and practical manner. Prof. Forbes has been able to command the services of a very able corps of assistants, including Messrs. C M. Weed, H. Garman, F. M. Webster, John Marten, and C. A. Hart.

Missouri. In the session of 1867-'68 the legislature of Missouri passed an act establishing the office of State entomologist, and directed that the reports of this officer should be made to the State Board of Agriculture. The first and only appointee to this position was Prof. C. V. Riley, who had at that time become prominent as an entomologist through his writings in the "Prairie Farmer," of Chicago, with which paper he had been for some time connected, and through his editorship, in association with Mr. B. D. Walsh, of the "American Entomologist," of which one volume had then been published. He entered upon his duties April 1, 1868, and published his first annual report in December of that year. From that date there followed annually eight additional reports, the ninth being submitted March 14, 1877, and covering the year 1876.

There is no need of any comment upon these nine Missouri reports before any body of economic or scientific entomologists. They are monuments to the State of Missouri, and more especially to the man who wrote them. They are original, practical, and scientific; they cover a very great range of injurious insects, and practically all the species which were especially injurious during those nine years received full and careful treatment. They may be said to have formed the basis for the new economic entomology of the world, and they include a multitude of observations and intelligent deductions which have influenced scientific thought. The value to the agriculturist, as well as to the scientific readers, was greatly enhanced by the remarkable series of illustrations which were drawn by the author and engraved upon wood by the most skilful wood engravers of that time. Aside from a few of the illustrations to the Flint edition of Harris, they are the best woodcuts ever made of insects in this country, and as a whole the drawing far excels that of the Harris illustrations in its lifelike accuracy, artistic beauty, and closeness of detail. Prof. Riley abandoned his Missouri work on taking up the directorship of the U. S. Entomological Commission, and in pursuance of a shortsighted policy Missouri has never since had a State entomologist.

Other States and the Hatch State Agricultural Experiment Stations. Massachusetts, New York, Illinois, and Missouri are the only States which may be said to have supported official economic entomologists. There are letters on file in the Division, dated in 1880, from Mr. J. T. Humphreys, who announces himself in his letter head as "Late naturalist and entomologist to the Georgia Department of Agriculture;" but although I have made something of an effort to learn the details of Mr. Humphreys's employment, I have so far been unsuccessful. The State of Pennsylvania has for some years handled its economic entomology by means of an officer who holds an honorary commission from the State Board of Agriculture. This commission was held for some years prior to his death by Dr. S. S. Rathvon. At the present time Dr. Henry Skinner, of Philadelphia, and Dr. R. C. Scheidt, of Lancaster, are entomologists to the State Board.

In the spring of 1888, the State Agricultural Experiment Stations, founded under the Hatch Act, were organized. A number of entomologists were soon appointed and active work began practically in the month of February. This movement, the importance of which to American economic entomology can hardly be overestimated, is too recent to require full treatment here.

The first entomological bulletin published by any of the experiment stations was issued in April, 1888, from the Arkansas station by Mr. S. H. Crossman, and was entitled The Peach tree Borer and the Codling Moth. Bulletins from Hulst, in New Jersey; Morse, in California; Tracy, in Mississippi; Ashmead, in Florida, and Weed, in Ohio, followed in May. Popenoe in Kansas, and Perkins in Vermont, published one each in June, and Fernald, in Massachusetts, and Lugger, in Minnesota, one each in July.

Through the kindness of Mr. A. C. True, director of the Office of Experiment Stations of the U. S. Department of Agriculture, I am in possession of a bibliographical list of the entomological publications of the agricultural experiment stations down to the present month. This was drawn up by Mr. F. C. Test, of Mr. True's office, and will be published as an appendix to this address. An analysis of its contents shows that 42 States and Territories have employed persons to do entomoloigical work, and that the number of experiment station workers who have published entomological bulletins or reports reaches 77. Not half of these writers, however, have been officially designated as entomologists to the station. Of those so designated there are 28; 8 have held the title botanist and entomologist; 6, consulting entomologist; 4, assistant entomologist; 4, horticulturist and entomologist; 1, special entomologist; 1, entomologist and physiologist; 2, entomologist and zoologist: 1, entomologist and superintendent of farms; 1, director, entomologist, and botanist; 1, vice-director, horticulturist, entomologist, and mycologist; 1, special agent; 1, apiarist; 2, biologist. The other writers bear titles which indicate that they are not specialists in entomology. They are as follows: Agriculturist, 1; assistant agriculturist, 1; horticulturist and agriculturist, 1; horticulturist, 3; assistant horticulturist, 1; botanist and mycologist, 1; director, 2; botanist, 2; superintendent of grounds, 1; pomologist, 1; specialist, 1; veterinarian, 1; clerk and librarian, 1.

The entomological publications of these experiment stations have numbered 311, of which 88 have been annual reports, 213 bulletins, and 10 leaflets and circulars. In character the bulletins and such reports as have definite titles may be thrown into three categories: 1, those which treat only of insecticides and insecticide machinery, 40; 2, those which contain compiled accounts of insects, with measures for their destruction, 60; 3, those which contain the results of more or less sound original observation, with compiled matter and matter upon remedies 117. There are also two small classes: 1, apiculture, 6; and 2, classificatory, 4.

It would be a matter of very considerable interest if I were able at this time to give a more critical summary of the results achieved by our experiment station workers in entomology. The little analysis which precedes shows a gratifying preponderance of bulletins and reports which contain results of original work; and yet at the same time we must remember that while these papers advance our knowledge of entomological science, the compilations may frequently accomplish greater practical good. This point is illustrated by a statement which I have from Prof. Garman, of the Kentucky station. He says that Bulletin No. 40 of his station, containing condensed accounts of some of the commoner and more injurious insects of the farm and garden, is the one for which there has been the greatest demand. The original edition of 12,000 was soon exhausted, and another lot has since been printed. The bulletin was prepared by request, and naturally is not the sort of work which our station entomologists prefer to do. "Its success," writes Prof. Garman, "has been a lesson to me as to what farmers want and will use."

It occurred to me that it might be valuable to have a statement from each of the experiment station entomologists as to the piece of work he had done which seemed to have accomplished the most practical good, in the light of his own accurate information concerning the farming population of his State. I therefore addressed letters to nearly all of the station workers in entomology, but have received replies from only about half of them, so that a statement of this kind would hardly be justified. It is interesting to note, however, that experiment station workers place in very high esteem the results of their correspondence with farmers and of their lectures before farmers institutes and other bodies. It is in these two ways that the popular sentiment among agriculturists as to the importance of economic entomology is being much more rapidly spread than, perhaps, by the publication of bulletins upon injurious insects.

Canada

The Rev. C. J. S. Bethune, for many years one of the most prominent writers on entomology in Canada, and a well-known contributor to the columns of the *Canadian Farmer* on the subject of agricultural entomology, was largely responsible for the organization of the Entomological Society of Ontario, and for the first appropriation of money made to that society with a view to the development of economic entomology among our neighbors across the border. The council of the Agriculture and Arts Association of Ontario in 1869 voted a grant of $400 to the Entomological Society of Ontario for the year 1870, on condition that the Entomological Society should furnish an annual report, should found a cabinet of insects, useful or prejudicial to agriculture and horticulture, to be placed at the disposal of the council, and that it should also continue to publish the *Canadian Entomologist.* This was the origin of the first annual report of the Ontario society, which was published in 1871 by the Agricultural and Arts Association. This association also gave the society $100 additional, and the Fruit-Growers' Association of Ontario $50 additional, to be used for the purpose of illustrating the report. During the session of the Legislature of the Province of Ontario in 1870-71 the Agriculture and Arts Act was passed. By this Act the Entomological Society of Ontario was incorporated, and a grant of $500 per annum was made to it from the Provincial Treasury. In 1872 the Legislature made an extra grant of $200 for the purchase of woodcuts, etc., making the total appropriation $700. In 1873 an extra grant of $500 was made, and the annual grant for 1874 was increased to $750. In 1875 the grant was $750, plus $100 for illustrations; in 1876 $750, plus $500 towards the expense of an exhibit at the Centennial Exhibition at Philadelphia; in 1877, 1878, and 1879 it was $750 per annum, and in 1880 the grant was increased to $1,000, at which sum it has continued since that date. The Government also pays the expense of printing the annual report.

The society has conscientiously complied with the conditions of the grant. Its reports, published annually, have greatly increased in size and in the general interest of their contents. They have contained much matter of economic value as well as of educational interest.

In 1884 the Department of Agriculture of Canada established the office of honorary entomologist, and this office was filled by the appointment of Mr. James Fletcher, at that time an employee of the Government Library at Ottawa, and already widely known in entomological circles through his active interest in the Ontario society and his contributions to its publications. On July 1, 1887, Mr. Fletcher was transferred to the staff of the Dominion Experimental Farm at Ottawa as entomologist and botanist. Mr. Fletcher's footing since that date has been practically identical with that of an entomologist to one of our State experiment stations, except that his field is larger. He has published a report yearly in the Annual Report of the Experimental Farms, published as an appendix to the report of the Minister of Agriculture. Mr. Fletcher has shown himself to be a man of extraordinary energy, a most entertaining writer, and a most careful observer, and one who has always kept the practical part of his work foremost in view. He has paid a great deal of attention to a side of his work which is neglected by many of our own official entomologists, namely, personal intercourse with farmers. frequent talks on injurious insects at farmers' institutes, etc., and has in this way built up a very large clientage among the most intelligent agriculturists in the Dominion. In economic entomology Canada at the present day is perhaps in no way behind the United States, and this is largely due to Mr. Fletcher's individual efforts, aided and encouraged as they are by the warm support of the eminent director of the experimental farm system, Mr. William Saunders, himself a pioneer in economic entomology in Canada and the author of one of the most valuable treatises upon the subject that has ever been published in America. Canada has the man and the knowledge, but has been hampered by want of funds. The result is that while she has immediately and intelligently adopted the results of researches made in this country, she has not been able to lead us in original investigation.

European Countries.

In general it may be said that Europe has not felt the need of entomological investigation from the economic standpoint to anything like the same extent as the United States. A climate much less favorable to the undue multiplication of injurious insects than that of North America, and which, moreover, seems to act as a barrier against the importation of foreign destructive species, the actually smaller number of injurious species and the vastly greater familiarity with all phases of the life-history of these species by all classes of the people, partly resulting from the older civilization, partly from educational methods, and partly from the abundance of elementary and popular literature on questions of this character, the denser population, and the resulting vastly smaller holdings in farms, the necessarily greatly diversified crops, the frequent rotation of crops, together with the clean and close cultivation necessitated by the small size of the holdings, and the cheaper and more abundant labor, have all resulted in a very different state of affairs regarding the damage which may be done by injurious insects. In summarizing these points, the Chief of the Agricultural Section of the Ministry of Agriculture of Prussia, in conversation with the writer last summer, argued that Germany does not need to employ general economic entomologists; that its experiment stations seldom receive applications for advice on entomological topics. Special insects, it is true, occasionally spring into prominence; the Phylloxera is one of these, and in an emergency like the Phylloxera outbreak, the work is handled by special commissions. European nations, therefore, can afford to let the insect problem alone to a much greater extent than the United States, for the reason that it is of infinitely less importance with them than with us. The most simple remedies, such as hand-picking, together with a rigid enforcement of the public regulations regarding hand destruction, usually suffice to keep injurious insects in check. Nevertheless, insect outbreaks do occasionally occur, and there is a certain percentage of loss every year from the work of injurious species. The results obtained in the United States, where the number of native injurious species is much greater than in Europe, and where we have in addition to deal with a host of imported species—in short, where the fighting of insect foes has become an absolute necessity—have, however, acted to a certain degree as incentives, not only to other countries which labor under the same climatic disadvantages as the United States, but even to a certain degree to European countries, where more thorough investigation of injurious insects by competent persons especially appointed for the purpose is gradually becoming thought worth while.*

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Great Britain.

There is not and never has been in Great Britain a special government appropriation for work in economic entomology. In 1885 Mr. Charles Whitehead suggested to the lords of the Committee of Council for Agriculture, that it would be valuable to publish reports upon insects injurious to various farm crops. He prepared, and the council published, a series of four reports upon insects injurious to the hop plant, corn and leguminous plants, to turnips, cabbage and other cultivated cruciferous plants, and to fruit crops. In 1886 Mr. Whitehead was appointed agricultural adviser and prepared a report upon insects and fungi injurious to crops of the farm, orchard and garden for 1887-88, and in 1889 the Board of Agricultnre was formed, and Mr. Whitehead was retained as technical adviser, especially with reference to insects and fungi injurious to crops, but also with reference to other agricultural questions. He prepared annual reports on insects and fungi for 1889, 1891 and 1892, and a number of leaflets and special bulletins on insects unusually prevalent from 1889 down to the present time. I learn from Mr. Whitehead, that there is no specific law authorizing this expenditure; that his work has been continuous since 1887, and that he has received an annual sum of £250 only. The more important of the special bulletins and leaflets which have been issued have been: Special Report on an attack of the Diamond-back Moth Caterpillar, 1892; Caterpillars on Fruit Trees; Hessian Fly; Moths on Fruit Trees, 1890; Apple Blossom Weevil, Raspberry Moth and the Mangel Wurzel Fly, 1892; Black Currant Mite, 1893; and the Red Spider and Apple Sucker, 1894.

While Mr. Whitehead has, therefore, been the only governmental worker in agricultural entomology, a very considerable work has been done in a semi-official way by an untiring and public-spirited woman, Miss Eleanor A. Ormerod, who is, or rather was, in her official capacity, honorary consulting entomologist to the Royal Agricultural Society. From 1876 to 1893 Miss Ormerod held this position; conducted the correspondence of the Royal Agricultural Society on the subject of injurious insects, and published at her own expense a series of annual reports, seventeen in number, which have contributed very largely to the diffusion of knowledge concerning injurious insects in Great Britain among the farming classes. She has had a most conservative class of people to deal with, and has encountered many obstacles. She has shown herself ingenious, careful and receptive to a degree, and at the same time possessed of an enthusiasm and an unlimited perseverance which are calculated to overcome all obstacles. She has studied many of the English crop enemies *de novo*; she has popularized the work of other English entomologists, and has made accessible to the agricultural class the work of John Curtis and Prof. Westwood, and has adopted, and strongly advocated the adoption of, measures found to be successful in other countries, particularly in America. The good which Miss Ormerod has accomplished can hardly be estimated at the present time, but she will deserve, at the hands of posterity, canonization as the patron saint of economic entomology in England.

Aside from her annual reports, Miss Ormerod has published a large work entitled, Manual of Injurious Insects and Methods of Prevention, and numerous smaller works, treating of the Hessian fly, sugar-cane insects and the injurious insects of South Africa, the last two being devoted to the agricultural interests of the English colonies.

* We regret that our space will not permit us to publish the whole of Mr. Howard's address. We are reluctantly compelled to omit his account of the work in foreign countries.—Ed.

Within the year the Royal Agricultural Society has made the office of consulting entomologist, or rather zoologist—for they have broadened the term—a salaried one, and Mr. Cecil Warburton, an able student of zoology, although not known as an entomologist, has been appointed to the position. Mr. Warburton has published one report, which is mainly compiled and devoted to extracts from the correspondence of the society, but it is too early as yet to judge of his capabilities from our standpoint.

Miss Ormerod's legitimate predecessor may be said to have been John Curtis, who, from the beginning of Dr. Lindley's *Gardener's Chronicle* contributed an important series of essays upon injurious insects to its columns, under the *nom de plume* "Ruricola" Mr. Curtis's connection with this famous agricultural journal was of great advantage to him, as it enabled him to secure information and specimens from all parts of the kingdom. He had also accumulated a large amount of information during the twenty years he was engaged in writing his great work upon British entomology. When the Royal Agricultural Society of England was founded, in 1840, the council of the Society invited Mr. Curtis to prepare a series of reports upon the insects affecting various crops cultivated in Great Britain and Ireland, and in the Journal of the Royal Agricultural Society for the years 1841 to 1857, he published a series of sixteen such reports The matter of these reports, and also of his previously published *Gardener's Chronicle* articles, was drawn upon largely for, and in fact forms the major portion of, his standard work upon Farm Insects, published by Blackie & Sons, London, Glasgow and Edinburgh, in 1860. Whether Curtis was remunerated for his work for the Royal Agricultural Society or not I am unable at this time to state, although he probably received some compensation. I learn, through the kindness of Miss Ormerod, that, chiefly on account of the value of his writings upon economic entomology, Mr. Curtis was awarded a pension from the civil list, which was augmented about three years before his death, on account of the sad loss of sight which he experienced.

In 1877 a strong effort was made to secure the appointment of a Government entomologist. A conference was held at the Society of Arts, which was largely attended and was presided over by the Duke of Buccleugh, K.G. The most important paper read was by Mr. Andrew Murray, and after a long discussion the conference resolved :

That much of the loss occasioned by insects is preventable and ought to be prevented ; that it properly belongs to government to provide the necessary means for protecting cultivators from this loss, as it is only by simultaneous action over considerable districts that it can be effectually done, and government alone possesses or can obtain the requisite means of indorsing such action ; that the president and lords of the Council and the Agricultural Societies of the United Kingdom be informed of the opinion of this conference and urged to take the subject at once into their consideration, with a view to providing a remedy.

While we have no doubt that this conference was of sufficient importance and attracted enough attention to induce the president, lords, etc., to take the subject into consideration, no further action resulted.

Ireland.

Mr. George H. Carpenter was appointed in 1890 consulting entomologist to the Royal Dublin Society, and has submitted four reports, entitled, Report on Economic Entomology for the year 1890, and the same for 1891, 1892 and 1893. Reprints of these reports from the Reports of the Council of the Royal Dublin Society have been distributed Mr. Carpenter is assistant naturalist in the Science and Art Museum in Dublin, and I am not informed as to whether he receives special compensation for his work as consulting entomologist.

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India.

Among the English colonies the government of India stands out very prominently in the support which it has given to economic entomology. A most interesting account of the beginning and growth of this work has been transmitted to me by Mr. E. C. Cotes, from which I take, for the purposes of this paper, the following facts :

The present arrangement was the outgrowth of two reports, one on the wheat and rice weevil and the other on insecticides, which were drawn up unofficially in the early part of the year 1888 by Mr. Cotes, at the suggestion of the secretary to the government of India, in the Revenue and Agricultural Department. Mr. Cotes was at that time in charge of the entomological collections of the Indian Museum, and the reports were published by the government, with the consent of the trustees of the Museum, as the first two numbers of an official series entitled Notes on Economic Entomology. The title of this serial was subsequently changed to Indian Museum notes, when the trustees of the Museum consented to charge themselves officially with the conduct of the investigation. The work really commenced in March, 1888, when Mr. Cotes was deputed to attend an agricultural conference at Delhi, where the part to be taken in the scheme by the various provincial governments was discussed. As a result of this conference the departments of land records and agriculture, attached to the various provincial governments, undertook to arrange for the submittal of reports and specimens from officials concerned with agriculture in all parts of India. The task of collating the results, and also of carrying on such investigations as could be conducted at headquarters, was intrusted to Mr. Cotes, aided by a staff of six office assistants, whom he was permitted to select. Circular letters were sent out to all parts of the country, and large numbers of reports and specimens soon began to come in. The results were published from time to time and freely circulated among all interested. One of the greatest of the early difficulties was the identification of species, but this was accomplished mainly through correspondence with specialists in different parts of the world. The results of six years of work are, in brief: The ascertaining of the identity of several hundred of the more important injurious species which affect crops in India. The recording of the nature of the damage occasioned by them, and the tracing out of the main facts in the life histories in a large number of cases. Information has been continuously supplied to officials and planters as to the nature of their insect pests and the most promising methods of treatment. Many experiments have been tried with a view to the adaptation of insecticides in use in other parts of the world to the requirements of special crops under cultivation in India. Fourteen numbers of the Indian Museum Notes, comprised in three volumes, have been published, and a number of special reports have also been sent out; one on the locust of northwest India, and one entitled Handbook of the Silk Insects of India. Two preliminary lesson sheets for use in native schools have also been prepared by the office. A thorough investigation of the insects affecting the tea plant is now in progress. The funds appropriated for the support of entomological investigation have varied from year to year; the only special grant for the purpose is one of 5,000 rupees per annum from the government of India. This is paid to the account of the Indian Museum, and forms a part of a general fund which is distributed at the discretion of the trustees, partly for the maintenance of the institution and partly for the support of the work carried on in various departments, one of which includes economic entomology. The work was at first looked upon in many quarters as a matter of comparative insignificance, but Mr. Cotes informs me that its importance is now very generally recognized, and that strong representations are being made in influential quarters, urging the desirability of extending the scope of the work, and making it, like other branches of research, an integral portion of the Agricultural Department of the government. The work which has so far been done by Mr. Cotes and his assistants has been admirable, and we know of no more interesting publication upon entomology than the Indian Museum Notes.

South Africa.

The *Agricultural Journal*, the official organ of the Department of Agriculture of Cape Colony, has been paying a great deal of attention to economic entomology during the last four or five years. The so-called Australian bug (*Icerya purchasi*), the grapevine Phylloxera, and the injurious locusts seemed to have roused the colonists to the necessity for more or less investigation, and the Agricultural Department has taken hold of the matter with some little energy. No distinctively official entomologist, however, was ever appointed. Privately Mr. S. D. Bairstow and one or two other colonists have made certain investigations, and their correspondence with Miss Ormerod, honorary consulting entomologist to the Royal Agricultural Society of Great Britain, resulted in the publication of Miss Ormerod's little book, entitled Notes and Descriptions of a Few Injurious

Farm and Fruit Insects of South Africa, with Descriptions and Identifications of the Insects by Oliver E. Jansen. Prior to the publication of this work Miss Ormerod published a leaflet entitled Observations on the Australian Bug, treating the insect from the South African standpoint. For several years, from 1889 to 1893, Mr. Louis Peringuey, an officer of the South African Museum at Cape Town, was employed as entomological adviser to the Department of Agriculture, and drew £100 per annum for his services. His duties in the Museum, however, did not permit him to devote anything like his entire time to entomological work, and in his advisory functions he chiefly answered questions as to the names of insects and the best remedies for insect pests. Acting upon his advice, the government attempted to stamp out the phylloxera by means of the bisulphide of carbon treatment, but without success, and he resigned his office in 1893. Since that time, and in fact for some time previously, the director of the Botanic Garden at Cape Town, Prof. P. MacOwan, a man of very wide information, although not a trained entomologist, has answered entomological questions for the government. His communications, most of them subsequently published in the *Agricultural Journal*, show him to be a clear-headed, practical man, and it is a pity for the interests of the colony that he is too much interested in his garden and botanical work to take up economic entomology as a study. Mr. MacOwan modestly writes, under date of April 11, 1894:

> Unfortunately, I have been in the habit of reading everything that comes in the way and indexing it, so that really they consult my indexes. It is only thus, in the rough, practical way that a garden director, in a dozen years, gets some acquaintance with injurious and beneficial insects that I have answered questions of economic entomology. I only know what I have seen and fought against in the Botanic Garden, and anybody is welcome to such experience. . . . I only wish we could get some such man as seems to be raised easily in the States to do practical science work in the love of it.

Australia.

The Australian colonies of Victoria, New South Wales, Queensland, South Australia and Tasmania have all interested themselves to a very considerable extent in the subject of economic entomology. With an energy and receptivity to new ideas akin to our own, their agricultural societies and departments of agriculture have not been content to allow injurious insects full sway, but all have, in one form or another, made efforts to remedy the damage.

Tasmania. The earliest attempts were made in Tasmania nearly twenty years ago, when the Codling-Moth Act was introduced in the legislative assembly. The provisions of this Act were quite as wisely drawn as those of any subsequent injurious-insect legislation. It was not until 1891, however, that a definite council of agriculture was established by this colony, and not until 1892 that an official entomologist was appointed. In February, 1892, Rev. Edward H. Thompson, a clergyman of the Church of England and a naturalist of very considerable attainments, who had made himself prominent in this connection by his writings for the local press, was appointed entomologist and pathologist to the Council of Agriculture. Authority for the appointment was given in section 13, clause 1, of the Council of Agriculture Act, and reads as follows:

> 3. To employ from time to time, with the approval of the governor in council, persons competent to give instructions of a practical character in matters pertaining to agricultural and horticultural science, and to arrange for occasional lectures on subjects of interest to cultivators of the soil.

Mr. Thompson's annual compensation was fixed at £300, which in 1894 was reduced to £270, in pursuance of a policy of general retrenchment. The entomologist has charge of no funds for expenses, and up to the present time has been allowed no assistants. Very considerable interest has been aroused, however, in the subject of economic entomology. Mr. Thompson has lectured upon insect pests throughout the colony, and during 1893 received nearly 1,500 letters of inquiry. A little volume of 100 pages, entitled Handbook to the Insect Pests of the Farm and Orchard; their Life History and Methods of Prevention, Part I., has been published, and will be followed by others in the same line, provided the appropriations continue.

New South Wales. In New South Wales there was started in 1890 an important publication under the Bureau of Mines and Agriculture, entitled *The Agricultural Gazette* of New South Wales. To this periodical Mr. A. Sidney Olliff, entomologist to the

Australian Museum at Sydney, has contributed many important articles on entomological subjects, which have resulted from his appointment to the charge of the entomological branch of the Department of Mines and Agriculture. Whether Mr. Olliff receives a separate compensation for his work in this direction from the Department, aside from his salary as an officer of the Museum. I have been unable to learn. The prominence given to entomological matters in the *Gazette*, however, is an indication of the live interest taken in the subject. In a series of entomological bulletins, begun in 1892, Mr. Olliff's name appears on the title page as "Government Entomologist, New South Wales." Another able entomologist is employed in the Technological Museum at Sydney, in the person of Mr. W. W. Froggatt, who has, under the "Technical Education Series" of leaflets, published at least one important paper bearing upon economic entomology, which has reference to the damage done to boots and shoes by *Anobium* (*Sitodrepa*) *paniceum*.

QUEENSLAND. In Queensland there is at the present time no official entomologist, although one of the best bits of printed matter relating to economic entomology which has been issued by any of the Australian colonies emanated from the Queensland Department of Agriculture. In 1889 there was published a report on insects and fungus diseases by Henry Tryon, who held, and probably still holds, the position of assistant curator of the Queensland Museum at Brisbane. This is a thoroughly practical and very able report, covering some 250 pages, and contains a great amount of important information. The report is designated as No. 1 upon this subject, but No. 2 has, unfortunately, not yet been published. The occasional bulletins issued by the Queensland Department of Agriculture, giving an account of the agricultural conferences held in different districts of the colony, show a very live interest in the warfare against insects, and this has been particularly the case since Prof. E. M. Shelton, an Englishman by birth, but since his early boyhood a resident of America, and long engaged in agricultural teaching and experimental work here, was employed by the Queensland government as instructor in agriculture in 1890. The Department has begun the publication of a series of bulletins giving the results of recent experiments made at the American agricultural experiment stations, edited by Prof. Shelton, in which late entomological information is given.

SOUTH AUSTRALIA. The first work on injurious insects in South Australia was done by Mr. Frazer S. Crawford, a practical man of wide reading, who interested himself for some years before his lamented death in the study of insects and fungus pests. He read an important paper, under the title of "Insects and fungus pests," before the first congress of agricultural bureaus of South Australia in March, 1890, illustrating the paper by careful drawings done and engraved by himself. It is likely that, had Mr. Crawford lived, he would have been appointed official entomologist to the colony of South Australia. Since his death, however, a vivid interest in the subject has been kept up, largely through the interest shown in the matter by *Garden and Field*, an important agricultural newspaper published at Adelaide, the editor of which, Mr. W. C. Grasby, has visited this country, and is very appreciative of the work which has been done in the United States. The government viticultural expert, Prof. A. J. Perkins, is also a man of some entomological knowledge, although his researches have mainly been connected with the subject of insects injurious to the vine.

VICTORIA. In August, 1890, a conference was held at Melbourne, Victoria, with representatives from the board of viticulture, the council of agricultural education, the different horticultural societies, and wine and fruit growers' associations, for the purpose of considering means for the suppression of insect pests injurious to vegetation; and partly as a result of this conference and further agitation, Mr. Charles French was, in 1891, appointed entomologist to the government of Victoria, under the Department of Agriculture of the Colony. Mr. French's work is largely included in the two parts of an important handbook of the Destructive Insects of Victoria, the first part published in 1891 and the second in 1893. These reports are written in a popular style, and much attention is given to means of destruction. Their distinguishing feature, however, consists in their illustrations, which are colored, and many of which are very lifelike.

THE BRITISH WEST INDIES.

Injurious insects in the British West Indies have only recently received official or semiofficial attention, with the single exception that in the year 1801 a special commission composed of members of the general assembly of the Bahamas was appointed to investigate the damage done to the cotton crop by the red bug (*Dysdercus*, probably *suturellus*) and the chenille (*Aletia xylina*). Within the past two or three years, however, several of the islands have taken up the subject, with or without governmental support, and there is now a rapidly increasing spirit of investigation.

JAMAICA. In the appointment of Mr. T. D. A. Cockerell, a well-known entomologist, to the office of curator of the Institute of Jamaica, at Kingston, it was specially desired that the appointee should conduct investigations in economic entomology and answer all correspondence in this direction which might come in from planters. Upon taking charge of his new office, in June, 1891, Mr. Cockerell was immediately struck by the extraordinary abundance of scale insects in Jamaica, and their importance as enemies to many cultivated plants. With his accustomed energy he at once undertook the study of these insects, and has since published many papers about them, which have been contributions to knowledge. He started an interesting series of stylographic notes, mainly about injurious insects, disseminated much information on this subject among the planters, and fostered an interest in the study which it is to be hoped will not die out. He was succeeded in office in June, 1893, by Mr. C. H. Tyler Townsend, formerly an assistant in the Division of Entomology, U. S. Department of Agriculture, and entomologist to the State Agricultural Experiment Station of New Mexico, who, during the short time of his residence in Jamaica, followed in the lines laid down by Mr. Cockerell, and published a number of very interesting notes, both in the journal of the Institute and in the stylographic series of notes, which he continued. Mr. Townsend resigned in May of the present year, and we have not heard that his successor has been appointed.

LEEWARD ISLANDS. Although no officially designated entomologist is employed by the Leeward Islands, Mr. C. A. Barber, superintendent of agricultural for these islands, is a well-informed man, a trained botanist, and fully alive to the importance of entomological work. He has conducted some important investigations on the sugar-cane shot-borer and other sugar-cane insects, which have been published in the Leeward Islands *Gazette*.

TRINIDAD. No official recognition of economic entomology has yet been reached in this island, but a very active organization, known as the Trinidad Field Naturalists' Club, has been established, which is well worth mention in this connection, since its president, Mr. H. Caracciolo, and its secretary, Mr. F. W. Urich, have interested themselves especially in the subject of economic entomology and are laboring to interest the government. His Excellency the Governor occasionally attends the meetings of the club, and by the institution of prizes for essays and by similar means, a widespread interest in economic entomology is being aroused. The appointment of an official entomologist is probably a matter of only a short time. *The Journal of the Field Naturalists' Club* is an interesting periodical, full of entomological information, and is now in its second volume.

NEW ZEALAND.

New Zealanders have for some time been fully alive to the importance of the study of economic entomology. They have passed laws concerning the destruction of the codling moth and have made an effort to establish quarantine regulations against the introduction of infested substances from abroad. No governmental entomologist has been appointed, although the Department of Forestry and Agriculture published, in 1887, a monograph of the Coccidæ, by Mr. W. M. Maskell, registrar of the University of New Zealand, the title page of which reads : "An Account of the Insects Noxious to Agriculture and Plants in New Zealand." A second part of this account was promised in an introductory note, but has not appeared. Mr. Maskell has also written upon injurious insects in some of the New Zealand newspapers. Much credit is due to a corresponding member of this society, Mr. R. Allan Wight, of Auckland, for the public-spirited interest which he has taken in economic entomology. Nearly every number of the *New Zealand Farmer* for several years has contained lengthy articles from his pen, and he has travelled a great deal for the purpose of lecturing before fruit growers' associations and other farmers' organizations. The editor of the *New Zealand Farmer* has also helped the good work along, and has published editorially a number of articles upon the subject. New Zealanders are agitating the question of the appointment of an official entomologist, but at this date seem to have little hope of immediate success.

. . . .

In Conclusion.

In concluding a review of this character, an American writer may perhaps be pardoned for an exhibition of national pride. Writing in 1870, Dr. A. S. Packard, in his first annual report upon the Injurious and Beneficial Insects of Massachusetts, compared the attention paid to economic entomology in this country with that which it received or had received up to that time in Europe, very much to our own discredit. In the twenty-four years which have intervened the change has been vast. All of the great advances in our science have come from America, and it may justly be said that, aside from the one department of forestry insects, the whole world looks to America for instruction in economic entomology.

These great advances, we must remember, would not have been possible without legislative encouragement. Activity on the part of workers and appreciation on the part of the people and their representatives have gone hand in hand. At the present time the amount of money expended for work in economic entomology is far greater in this country than in any other. Our regular annual expenditure in the support of entomological offices amounts to about $100,000, very nearly all of which is appropriated by the General Government, $29,000 going to the Division of Entomology of the Department of Agriculture and about $60,000 to experiment-station entomologists. To this amount must be added the large sums expended annually in publishing our reports and bulletins. The sum total thus reached will probably exceed the amount expended in this direction by the entire remainder of the world. Much more is therefore to be expected from American workers than from workers in other countries. The American members of this association must bear this fact in mind, and must realize that with the present rapid increase in interest among other nations nothing but the most energetic and painstaking work will result in the retention by the United States of her present prominent position. In some respects our results, have not been commensurate with our opportunities, but we have certainly justified in vast degree the money expenditure which has enabled us to prosecute our work. Not a year passes in which the sum saved to agricultural and horticulture, as the direct result of our work, does not amount to many times that which the Government appropriates, as has been often shown, and notably by our former president, Mr. James Fletcher, in his most able and interesting address at our Washington meeting in 1891.

In the good which has been accomplished in the way of remedial work against insects, the work of the official economic entomologists greatly exceeds that of all other classes of individuals. They have been investigators and teachers, students and propagandists; they have carried their researches into the fields of botany, bacteriology, chemistry, mechanics, and general zoology. Nearly all of the practical remedies in use to-day have been of their suggestion, and all great advances in recent years have come from their labors. Occasionally a practical agriculturist or horticulturist, unskilled in entomology, has discovered an important remedy, as was the case when Mr. J. S. Woodward sprayed his apple orchard with Paris green for canker-worms and found it to be a remedy for the codling moth; but Mr. Woodward would never have sprayed his trees at all but for the suggestion of Dr. LeBaron several years previously. And then, too, Prof. Cook, making the same discovery independently, was the one who, by his careful experiments, established public confidence in the remedy, and it is to him, more than to any one man, that the country to-day owes the great annual saving from the widespread adoption of this eminently practical remedy.

We have, then, done good work. We have accomplished results which have added greatly to the productive wealth of the world. We have justified our existence as a class. We are now better equipped for the prosecution of our work than ever before, and it may confidently be expected that the results of the closing years of the century will firmly fix the importance of economic entomology, in the minds of all thinking men of all countries.

On motion of Dr. Lintner, the thanks of the society were unanimously extended to the president for the admirable address presented.

A letter from the secretary, Mr. Gillette, announced that he would be unable to attend the meeting.

The following active members were elected:

F. C. Test, C. E. Chambliss and H. C. Hubbard, all of the Department of Agriculture, Washington, D. C.; Victor H. Lowe and F. A. Sirrine, of Jamaica, N. Y.; and F. W. Raine, of Morgantown, W. Va.

The following persons were elected to foreign membership:

Walter W. Froggatt, Technological Museum, Sydney, N. S. W.
Charles Whitehead, Barming House, Maidstone, Kent, England.
Geo. H. Carpenter, Science and Art Museum, Dublin, Ireland.
Dr. Geza Horvath, Ministry of Agriculture, Buda Pesth, Austria.
Prof. A. Targioni-Tozzetti, R. Staz. d. Entom. Agric., Firenze, Italy.
Prof. A. Giard, 14 Rue Stanislas, Paris, France.
M. J. Danysz, Laboratoire de Parasitologie, Bourse de Commerce, Paris, France.
Dr. J. Ritzema Bos, Wageningen, Netherlands.
Mr. Sven Lampa, Entomologist, Dep't. Agric., Stockholm, Sweden.
Dr. N. Cholodkowsky, Institut Forestier, St. Petersburg, Russia.
Dr. K. Lindemann, Landwirthschaftliche Akademie, Moscow, Russia.
Prof. A. Portschinsky, Bur. Entom., Ministère de l'Agriculture, St. Petersburg, Russia.
Mr. E. C Reed, Baños de los Cauquenos, Chile.

Mr. J. B. Smith, New Brunswick, N. J., presented the following paper:

BISULPHIDE OF CARBON AS AN INSECTICIDE.

By J. B. Smith, New Brunswick, N. J.

Bisulphide of carbon as an insecticide of very limited range has been known for many years; but for ordinary field crops it has not been in general use. In the 1893 meeting of the Association of Economic Entomologists, Prof. Garman mentioned that he had used it in the garden, covering melon vines with a tub and allowing a quantity of the bisulphide to evaporate, destroying thereby the aphides infesting the vines. This interested me greatly, because the melon louse, (*Aphis cucumeris*, Forbes,) is at times a most destructive pest in parts of New York and New Jersey, and one of the most difficult to deal with, owing to the fact that the leaves are close to the ground and that they curl as soon as seriously affected, making it simply impossible to reach them all, even with an underspray nozzle. A lot of pot-grown plants becoming badly infested with aphides in the botanical laboratory, I made a series of experiments, which were not recorded, but which determined that the liquid evaporated slowly, that it killed plant-lice very readily, and that it killed plants with equal facility if used in any large quantity. The appearance of the lice on cantaloupe and citron melons in New Jersey gave me an opportunity of making experiments, and Mr. Howard G. Taylor, of Riverton, N. J., kindly permitted me to kill as many hills as might be necessary to carry them on. I procured a dozen wooden bowls thirteen inches in diameter and six inches deep, inside measurement, and a series of small, graduated tumblers, in which "1 teaspoonful" and

"1 dram" corresponded To get at the rate of evaporation I poured 1 dram into a graduate and left it exposed; but placed in a shaded spot. It required fifteen minutes to disappear completely. Eleven badly infested hills were then covered by bowls, the vines being crowded under when necessary, and 1 dram in a graduate was placed under each. At the end of twenty minutes I lifted one bowl, found that less than half the material had evaporated; that all the Coccinellidæ were dead, the small lice dying, and the Diabrotica, ants, and large viviparous aphides were yet all alive. Ten minutes later there was little change. At the end of three-fourths of an hour, though scarcely more than half the liquid was gone, all save a few of the mature, wingless, viviparous females were dead. In one hour there was yet liquid in all the graduates; but all the aphides were dead, or appeared so. To test the matter, all the hills treated were marked to be examined later. Another series of infested hills were selected; but the experiment was varied by using 2 drams of bisulphide in some cases, using a shallow saucer in others, pouring the liquid on the ground in two cases, and covering other hills with large square boxes, some of them anything but tight. All coverings were left on for one hour, undisturbed. Examined first a square box covering a shallow saucer with two drams of bisulphide; found this all evaporated and every aphis killed. The bowls covering the saucers in which 1 dram was used showed like results. Two square boxes which were not tight, covering graduates with 2 drams of liquid, had all insects unaffected and the material scarcely half gone. The two bowls under which the bisulphide was poured on the ground were then lifted and all the aphides were found dead. All the other hills covered by bowls showed all the lice dead and not all the bisulphide evaporated. The hills first treated were again examined and there was no sign of recovered life anywhere visible. Bowls, graduates and bisulphide were left with Mr. Taylor, and all the treated hills were marked for later examination and to note the effects of the chemical. The experiments were made in the middle of a very hot day, the thermometer 93° in the shade, little or no wind blowing, and the sand so hot that it burned through shoe soles and could scarcely be handled more than a few moments at a time. Many of the hills showed the edges of the leaves, when the covers were removed, yellowed and set with numerous drops of a clear liquid. I feared permanent injury, but instructed Mr. Taylor if he found that the plants died to continue his work before the sun was high or after it was quite low. He wrote me under date of July 19: "The hills you treated when here last started to grow nicely, except the two hills where the carbon was poured on the ground; that killed them. The treated hills showed no lice at last examination." I am quite satisfied, from the experiments above recorded and from others that were not recorded, but were simply made to settle practical questions, that in melon fields at least bisulphide of carbon can be used satisfactorily and effectively. It has the enormous advantage of reaching everything on all parts of the plant, not a specimen escaping. With a stock of from 50 to 100 light covering boxes about 18 inches in diameter, as many shallow dishes, and a bottle of bisulphide the infested hills in a field can be treated in a comparatively short time.

The paper was discussed by various members, Mr. Southwick describing a combination of bisulphide with "Polysolve" which he had used in the form of an emulsion; and Mr. Lintner suggesting the use of cloth coverings in place of the boxes employed by Mr. Smith. Mr. Galloway suggested the use of the protection cloth used by seedsmen, which is treated with oil and is practically air-tight; Mr. Howard referred to the original suggestion by Garman, of the use of a wash-tub, which was thought to be very satisfactory for limited applications; and Mr. Smith and Mr. Saunders suggested the use of paper caps, similar to but smaller than, those used by farmers for the protection of the hay crop. The subject of the relation of parasites to the control of the louse was also discussed, as well as the effect of the bisulphide on the plants themselves, also upon the germination of seeds, when employed for the eradication of grain pests, etc.

AFTERNOON SESSION—AUGUST 14TH, 1894.

The report of the committee appointed last year, on co-operation among station entomologists, was presented by Mr. Smith, in the absence of the chairman. The report covered the matter of concerted work upon the life-history of special insects and their geographical distribution, the selection of certain groups of species to be studied from year to year, co-operation in experimentation with insecticide machinery to avoid duplication, and suggestions in the matter of securing conjoint legislative action among the States. The report was accepted and ordered to be printed, so that opportunity might be afforded members to examine it, in order to be able to take definite action on its adoption at the meeting of 1895.

A letter from Miss Eleanor A. Ormerod was read by the President, in which she expressed her regret at being unable to be present at the meeting

A paper by Mr. J. M. Aldrich, on spraying without a pump, was read in his absence by Mr. Davis. This paper described a scheme for the mechanical mixture of water and oil by the use of an ordinary Nixon climax nozzle, the combination of water and oil being made in the nozzle itself.

In the next paper Mr. C. L. Marlatt gave a review of a number of experiments conducted during the present year with several standard insecticide mixtures, also a series of experiments testing certain of the more important new insecticides or substances which seem to be of value as insect destroyers recently put before the public. The work was mainly to determine (1) the best methods of treating scale insects, (2) the effect of various mixtures on trees and foliage, in both summer and winter applications, (3) to show the relative merits of the old insecticides compared with some of the newer ones, and (4) the possibility of successfully combining insecticides and fungicides.

The paper was discussed by Messrs. Smith, Galloway and others.

Professor Galloway followed with a paper on various insecticide substances with which he had been experimenting for a number of years past, many of them in lines which had not hitherto been worked to any extent. He discussed particularly the kerosene emulsion made with lime, with resin wash, and the Bordeaux mixture. He also described a new method of making resin wash devised by one of his field agents in Florida, which, briefly, consisted in using purer caustic soda, causing a much more rapid formation of the resin soap. Various other mixtures of possible insecticide value were also suggested. The paper was accompanied by the exhibition of a large series of vials illustrating the various mixtures and combinations described by the author. The communication was generally discussed, and the important point emphasized that none of the emulsions were as perfect or as permanent as the standard milk and soap emulsions in common use, although some of them are possibly of value for immediate application.

In the absence of the author the following paper by Mr. Webster was read by the secretary :

SPRAYING WITH ARSENITES *vs.* BEES.

By F. M. WEBSTER, WOOSTER, OHIO.

At the Rochester, N. Y., meeting of the association, I gave the results of some experiments looking toward a solution of the problem, "Will spraying fruit trees while in bloom affect the bees which afterwards visit these trees for the purpose of securing either honey or any other substance carried to the hives, and if such be the case, what is the effect upon the inmates of such hives?" The results of my first attempt at settling this question will be found on record in Insect Life, vol. v, pp. 121-123, and it will, therefore not be necessary for me to repeat them here. On account of the meteorological conditions under which the experiments were carried on they have never been deemed conclusive in point of definite results, even by myself, and I have only been waiting a favorable season in order to finish the work. This year the time appeared to have arrived in which I might hope to solve the problem.

On May 2nd two apple trees in full bloom—and the blossoms were abundant—were thoroughly sprayed with a mixture of 1 ounce of Paris green to each 12 gallons of water. After the water had evaporated the poison could be clearly observed both on bloom and foliage. The application was made during the forenoon, the day being warm and clear, and during the afternoon quite a number of bees were caught while visiting the bloom and marked with carmine ink. The hives were located but a few yards distant from the trees, and both being situated at a considerable distance from any other trees at that time in bloom. None of these marked bees were afterwards found dead about the hives. During the night following the application there was a rainfall of 0.20 inch. On the following day bees were caught and killed by being dropped into a cyanide bottle where the cyanide was embedded in plaster of Paris, after the usual custom. As soon as the bees were dead they were dissected as follows: The posterior legs with pollen attached were severed from the bodies and placed in a small glass vial and securely corked. The contents of the abdomens, including the honey sacs, were next dissected out and placed in a separate vial, and the same mode of procedure was followed with the whole inside of the thorax, this giving me the entire bee except the head, anterior and middle legs, wings, and chitinous walls of the thorax and abdomen. Besides these a number of the bees were kept intact. The whole series was submitted to the assistant professor of chemistry of the Ohio State University, L. M. Bloomfield, to be tested for arsenic by the Marsh method. Mr. Bloomfield found the weight of material submitted in each case to be as follows: Posterior legs, with pollen attached, 0.3498 gram; contents of abdomens and honey sacs, 0.0990 gram; ditto thorax, 0.0710 gram. After the usual tests to prove the absence of arsenic in the reagents it was found that no arsenic was associated with the posterior legs or the pollen with which they were loaded, none had been left in the thoracic matter, but the material from the abdomens gave unmistakable proof of the presence of arsenic. The entire bodies of a number of the bees, taken at the same time from the same tree, were then washed with diluted ammonia water, three washings failing to give a trace of arsenic, but the bodies, after being thus treated, and being boiled in water slightly acidulated, gave distinct traces of the poison, thus eliminating any possibility of the poison having been introduced into the abdominal matter at the time of dissection and from the exterior. May 15th a crabapple tree (*Cratægus*) was sprayed with a mixture of the same ratio of Paris green as before, but in this case only the contents of the abdomens were retained. This matter, to the weight of 0.1463 gram, treated as in the preceding, gave unmistakable proof of the presence of arsenic.

Just at this stage of my investigations, chance, if such a thing there be, threw in my way still more conclusive proof. A few days prior to my last experiment, probably about May 10th, a small apple orchard on the experiment farm was sprayed with Bordeaux mixture, to which had been added Paris green at the rate of 4 ounces to each 50 gallons of the mixture. The bloom had at this time nearly all fallen from the trees the exceptions being an occasional belated cluster. Three colonies of bees, recently brought on to the premises, were located near by, to all appearances in a perfectly healthy condition. A few days after the application of the poisoned Bordeaux mixture one colony suddenly became extinct and a second greatly reduced in numbers, dead bees being abundant about both hives. From these colonies I was able to secure dead bees, and both honey from uncapped cells and dead brood from the hive that had been so mysteriously depopulated. When tested for arsenic by Mr. Bloomfield, precisely as with the other matter, contents of abdomens of the dead bees to the amount of 0.2334 gram revealed the presence of arsenic; 3.7061 grams of honey gave no trace of poison, while 1.8481 grams dead brood showed it to be present, and the entire bodies of the dead bees, thrice washed in ammonia water, as before explained, gave traces of arsenic. In regard to the honey I can only say that it was from uncapped cells, which might and probably did contain last year's honey that was still being used for a partial food supply by the bees.

Briefly recapitulated, arsenic was found present in the contents of the abdomens of bees frequenting recently sprayed blossoms, and we are at least free to assume that more or less of it was contained in the honey sacs. The dead bees three times washed in ammonia water, the latter not revealing the presence of arsenic externally, when tested showed its presence internally. Brood from uncapped cells (larvæ) of a colony suddenly dying without other apparent cause gave evidence of having died from the effect of arsenic which could have been introduced only from without.

In summing up the matter, then, I can see no other conclusion that can be drawn from the results of my experiments than that bees are liable to be poisoned by spraying the bloom of fruit trees, the liability increasing in proportion as the weather is favorable for the activity of the bees, and that all bloom must have fallen from the trees before the danger will have ceased.

Finally, I believe we now have the first conclusive proof of the effect on bees by the use of arsenical poisons in the orchard while the trees are in bloom. Heretofore all has been uncertainty, the statements made being based on either pure assumption, or, as in one instance, on the result of penning up bees and feeding them on poisoned sweetened water. It is certainly to the credit of the entomological fraternity of America that among their number but few could be found willing to risk a positive assertion based on such slender and unreliable information, and I feel that I am fully justified in pointing out the fact that in the case of two of our fellow members, Dr. Lintner and Mr. Fletcher, in the face of the legislative bodies of their respective States, both refused to commit themselves to the extent of making positive statements either one way or the other.

Mr. Lintner said that his position hitherto had been that laws ought not to be passed on the subject unless it was amply proved that harm did result to bees; and even in that event, the relative interests of the bee-keepers and fruit-growers should be carefully weighed, since it has been showed by him that many harmful insects also visited the blossoms, and they would stand an equal chance with the bees of being poisoned by the arsenical mixtures.

Mr. Smith said that the bee-keepers would always have an advantage when it came to securing legislative action, because, while they represented a comparatively small number of individuals, they are well organized, and can secure action where the much larger body of fruit-growers would be powerless.

Mr. Southwick read the following paper:

ECONOMIC ENTOMOLOGICAL WORK IN THE PARKS OF NEW YORK CITY.

By E. B. Southwick, New York City.

The work of the entomologist of the Department of Public Parks in New York City is the care of trees, shrubs, and plants in an entomological sense, and is under the direction of the Commissioners.

The ground to be covered is about 4,000 acres more or less, but most of the work is confined to the Central and other parks of the city proper. Two men, with the entom-

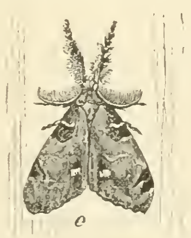

Fig. 56.—The male moth.

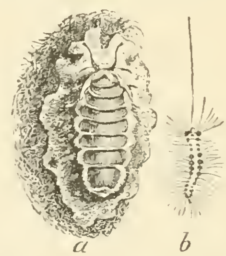

Fig. 57.—(a) The wingless female, (b) a young larva,

Fig. 58.—(c) The male chrysalis, (d) the female.

ologist, constitute the working force, save when the Orgyia cocoons become very abundant, then laborers assist in their removal.

The work is continued the year round every day save Sundays and an occasional holiday. A one-horse spraying machine carrying $2\frac{1}{2}$ barrels of liquid is used for the ordinary work of spraying, and a one-horse machine with a powerful force pump for knocking off plant-lice, cottony scale, etc. Various other tools and appliances are used for the removal of egg masses, webs, bag-worm, cases, larvæ, etc. The poisons used are those that are now quite commonly accepted to be the best, viz., London purple, Paris green, kerosene, crude petroleum, crude carbolic acid, bisulphuret of carbon, hellebore, pyrethrum, and others. The insect that requires the most attention the year round is *Orgyia leucostigma.* Fig. 56, the male moth; fig. 57, (*a*) the wingless female, (*b*) a young larva; fig 58, (*c*) the male chrysalis, (*d*) the female. This species is reduced in several ways.

(1) By hand-picking, by which means barrels of the cocoons and egg masses are removed each year. This work is carried on through the entire winter, when all the parks have to be gone over and the trees put in as good condition as possible.

(2) By jarring the larvæ (fig. 59) down with a pole so arranged that a blow from a mallet on a projection placed at the larger end of the pole, will jar down any that may be on the limb.

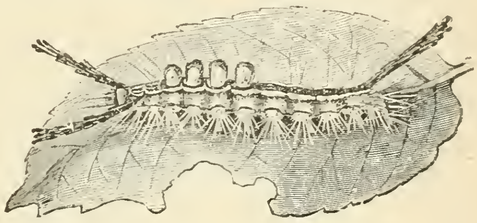

Fig. 59.

(3) By poisoning the foliage with London purple, which is quite effective, and used especially on very large trees that cannot be treated otherwise.

(4) By spraying the trunks of large trees that are covered with cocoons with an emulsion of petroleum and carbolic acid. This spray put on with force will penetrate most of the cocoons and destroy the pupæ or larvæ within, and many of the eggs that may have been deposited on the outside. This last method is only resorted to when we are unable to subdue them in other ways. Large quantities of the cocoons of this insect are collected each year and taken to the arsenal, where the parasites when bred are allowed to escape from the windows of the building to continue their work of parasitism.

The bag-worm, that at one time defoliated whole sections of the park, has been so subdued that it no longer gives us much trouble. Barrels of their cases have been removed from the trees, and each year we remove all that appear in devastating numbers as far as it is possible to do so.

The European leopard moth (*Zeuzera pyrina*) is one of the worst insects we have to contend with. It works in secret, and not until the damage is done can we locate it. Last season we spent two months on this insect alone, collecting and destroying the larvæ and pupæ. All the affected limbs were collected, the insects removed, and then the limbs were taken to the dump and destroyed by fire, in this way making the work complete. A great many wagon-loads were so collected and destroyed, and this work manifested itself this year in the lesser number of trees affected. This year we continued the work of collecting, but were only able to give two weeks to it, but with the aid of the gardeners we were able to destroy a great many. I believe the work we have done with this insect alone, has saved thousands of trees in our parks that would otherwise have been either destroyed or deformed. This question is a serious one when we are considering such valuable representations of our Silva as are collected in our city parks, for when a limb is amputated by this insect the stub is sure to die, and if the fungus does not immediately take possession of it, it will be amputated by a so-called gardener, who does not see the advisability of protecting the scar from fungi and insects; and here is offered a field for the greedy fungi, whose ever-present spores are ready to grow when the proper field offers itself, and they hardly ever fail to take possession, and all over, our fine elms can be seen with groups of *Agaricus ulmarius* in all stages of growth. This close pruning, without proper protection from insects and fungi, is one of the most important questions of our times, for every year great numbers of trees are destroyed for want of proper protection and a knowledge of seasonable pruning.

Right here the sap fly, which I take to be *Mycetobia pallipes*,* finds congenial habitat, and hundreds of trees are weakened by the flow of sap they cause, besides being unsightly from the slimy frass running down their sides. Those we treat with a crude carbolic-acid emulsion sprayed over them : after a time, however, they again show themselves, and have to be treated again.

The elm leaf-beetle is another pest that we have to fight, but with the force of two men, and miles of gronnd to cover, it is very difficult to keep this insect in subjection. Our success has been in preventive measures rather than otherwise. However, we do successfully destroy them when they have spread over the entire tree. As soon as the first eggs are discovered on the leaves, about the 1st of June, we immediately poison the foliage and keep them from spreading. When the larvæ come down to pupate and collect at the base of the tree, we treat them by spraying with an emulsion of kerosene and crude carbolic acid. In this way we destroy bushels of them, and with the spraying are able to keep them in check in our city parks.

The pine Chermes (*Chermes pinicorticis*) is another insect that is giving us a great deal of trouble, but we can subdue it most effectually with a stiff spray. The tree is then treated with the kerosene emulsion, and also those insects collected or washed down around the base of the tree. This has to be done at least three times a year. For the past seven years I have been using the stiff spray for different work, and it is one of the best means I know of for cleaning maples of Pulvinaria. Three years ago *Pulvinaria innumerabilis* was very abundant on a great number of trees in our parks, and I treated them with the hose and emulsion until I had them in fair subjection. The Chermes and Pulvinaria were at one time taken off with corn brooms, but the spray is much more effectual, and gets in among the small twigs without breaking them.

Scale insects are treated with washes and taken off with steel brushes, and are also sprayed with an emulsion, which covers the smaller branches. *Eriosoma Rileyi* is common on our young elms, and these are treated with the kerosene and carbolic emulsion.

The larvæ of the larger silk producers are collected and destroyed, as well as the cocoons. Datanas are collected by hand, as they are assembled in masses, and destroyed. The web-worm, always abundant in our parks, is collected either by taking down the twigs or, if the tree is a valuable one, by twisting them out and crushing the larvæ.

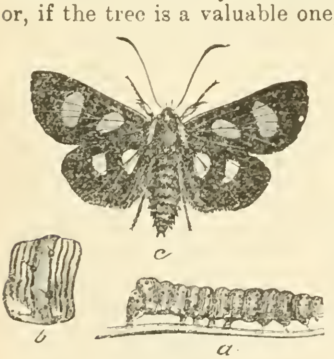

Fig. 60.—(*a*) The caterpillar, (*b*) a segment showing markings, (*c*) the moth.

Alypia octomaculata, fig. 60, (*a*) the caterpillar, (*b*) a segment showing markings, (*c*) the moth), is abundant where Ampelopsis is grown. These are effectually destroyed with the London purple solution.

The catalpa trees have been affected by a species of Cecidomyia, which causes the ends of the branches to turn black and break off. These are collected every year and destroyed before the larvæ leave the twigs. Leaf-skeletonizers are always abundant on many of our trees, and the Platanus and Liquidambar species have suffered most. These insects are cut off as soon as they can be seen working and destroyed. If left for any length of time they make the tree very unsightly.

Aphis species are treated with the kerosene emulsion after the colonies have been broken up with the stiff spray. I have found it impossible to get an emulsion to act upon many of the plant-lice on account of the secretion ; but let me play the hose on them a short time and they are disintegrated and demoralized, and many are killed outright by the shock ; then a fine spray of emulsion will reach them more effectually than otherwise. The more I have occasion to use a force of water the more I see the benefits that will accrue from it, especially in economic entomological work, for larvæ of many kinds can be knocked down by it, and my men have brought me birds that they have knocked out of a tree and captured.

*Mr. A. D. Hopkins says it is probably a species of Sciara.—E. B. S.

Other insects that are working on the foliage and in the stems of our plants we have in great numbers, but enough has been said to give an idea of some of the work we try to accomplish. Could we have sufficient force to do the work at the proper time there seems to be no reason why our parks could not be kept in the best condition; but with a force of but two men, with the entomologist, the wonder is that even a respectable showing can be made and the vegetation kept in as good condition as we now find it.

Mr. Howard said that he was very much interested in Mr. Southwick's account of the use of water as an insecticide and referred to some experiments in the same line which he had conducted, in which he showed a strong stream of water to be an effective agent against the rose slug and certain other insects.

Some discussion followed on the nature of the work and the probable species of the sap worm described by Mr. Southwick, which was thought by Mr. Lintner to be probably a species of Sciara.

Mr. Southwick followed with a second paper on the Wood Leopard Moth in the parks of New York, giving an historical account of the insect, its present status, the nature of the injury, the plants affected, and the means he had adopted to exterminate the pest. He stated that this is a most difficult insect to control, and could only be reached by cutting off the affected limb. In the case of rare trees, he had adopted the plan of putting a little bisulphide of carbon in the larval burrow with an oil can, closing the entrance with putty, which had proved an effective remedy.

The paper was discussed by Messrs. Smith, Howard and others.

In the absence of Prof. F. H. Snow, of Lawrence, Kansas, his paper was read by Mr. Victor H. Lowe, This communication, entitled "Work in Economic Entomology at the University of Kansas for the season of 1894," related particularly to the successful work with the chinch bug disease (*Sporotrichum globuliferum*), and a new alfalfa and wheat pest, which proved, on rearing, to be *Agrotis introferans*, Grote.

Mr. Smith reported that the same noctuid had been found by Mr. Gillette to occur very abundantly the present year in Colorado, and Mr. Howard referred to the occurrence of the moth in enormous numbers in Nebraska.

Messrs. Ashmead, Lintner and Hopkins were apppointed by the President a committee to nominate officers for the ensuing year.

MORNING SESSION—AUGUST 15TH, 1894.

Mr. Hopkins presented notes on some discoveries and observations of the year in West Virginia. The paper dealt chiefly with wood-working insects, but also covered various garden pests, such as the potato-scab gnat, the melon plant-louse, etc. The paper was discussed at some length by Mr. Smith, Dr. Lintner, Mr. Raine, and others.

The President read a letter from Mr. Webster, stating that he was unable to be present on account of being actively engaged in stamping out an attack of Fidia larvæ on grape roots, by the use of bisulphide of carbon.

Mr. Howard read a paper on the eastern occurrences of the San Jose scale, in which he briefly reviewed the history of the insect in the United States and showed that as a result of investigations during the winter of 1893-4 and the summer of 1894, the scale has been discovered in six localities in the eastern United States outside of New Jersey, while in the latter State it occurs at many points. He traced the introduction to two nursery firms in the state of New Jersey and one in Missouri. He detailed in full the remedial work which has been undertaken by the Division of Entomology of the United States Department of Agriculture in each of the six eastern localities, and showed that by virtue of the active measures which have been taken, the insect will probably be stamped out in the east by the close of the season.

The next paper was on the same subject, and discussion was therefore deferred.

Mr. Smith then read a paper on the San Jose scale in New Jersey. He stated that the scale had first come to him from a nursery in the state in March, 1892, but had not been recognized and he did not become aware of the true nature of the insect until he received the special circular sent out by the United States Department of Agriculture early in 1894. He described his work in connection with the stamping out of the scale, and particularly the active and energetic steps taken by the owners of the infested nurseries, from which the scale had been exterminated on young stock. He reported sending out letters to all persons who had obtained stock from the nurseries in question, enclosing the circular from the Department of Agriculture referred to, and the examination of nearly 100 orchards in person. As a result of his observations and work, he felt confident that the scale would ultimately be completely stamped out. The introduction of the scale was shown to have been either in 1886 or 1887, on some plum stock claimed to be curculio-proof, obtained from the San Jose region in California. Other fruit trees imported from California were also shown to be very likely infested. He gave some facts in regard to the trees and varieties which are most liable to be infested, also some notes on remedies.

In the discussion of these two papers Dr. Lintner considered the possibility of the introduction of the scale on fruit from California and concluded that the likelihood of the scale, so introduced, obtaining a foothold, was very slight.

Mr. Marlatt thought there was danger in placing too much confidence in the work or the statements of nurserymen as to the completeness of the eradication of the scale, pointing out the great difficulty of thorough extermination and the ease with which a random scale here and there could be overlooked. Mr. Banks referred to the publication in a New York paper of occurrences of the scale in two or three localities in New York, accompanied with the report of the adoption of active measures to stamp it out in each instance.

AFTERNOON SESSION—AUGUST 15TH, 1894.

In continuation of the discussion of the morning session, Mr. Smith exhibited specimens of California pears, obtained in Brooklyn which were covered with the San Jose scale in all stages of development.

Mr. Lintner exhibited an apple coming from Ottawa, Canada, handed to him by Mr. Saunders which was covered with the scales of *Mytilaspis pomorum*. (Fig. 51.)

Mr. Davis read a paper on mealy bugs and other lice. He gave a careful resume of the life history of the common mealy bug (*Dactylopius destructor*) with detailed descriptions of the different stages, also some notes on *D. longifilis*. He also described a coccus which he found on roots of clover, giving a general account of the habits and careful descriptions of the species. He also referred to *Eriococcus azaleæ* and other scale insects.

The paper was discussed by Messrs. Sirrine, Ashmead and Howard. Mr. Sirrine thought Mr. Davis's clover coccus was the same as the one found by Professor Forbes on white clover, and named by him *Coccus trifolii*, Mr. Ashmead coinciding in this view, and Mr. Howard stating that the *Eriococcus azaleæ* was certainly not an introduced species from Belgium, as suggested by the author, since the species is not known in Europe, and Professor Comstock has found it on wild plants near Ithaca, indicating that it is undoubtedly a native species. He said also that the two old species of Dactylopius referred to by the author had been shown by Berlese to be synonymous with European species, and that their life histories had been worked out by this author in great detail.

Mr. Marlatt read a paper on the Pear-tree Psylla in Maryland, in which he described the sudden occurrence of this northern pear pest in two orchards on the eastern shore of Maryland, in very destructive numbers. The introduction of the species was shown to have been upon nursery stock from infested regions in New York, and the author was confident that the injury, while excessively severe for the moment, would not be of long duration, judging from the past history of the insect. A brief review of the life history was given, with some notes on the natural enemies, notably a species of lace-wing fly, *Chrysopa oculata*, the larva of which feeds voraciously on all stages of the Psylla ; also various species of lady-birds which are useful in a similar way. The life history of the lace-wing fly was carefully worked out. Experiments with various insecticides on the eggs on the Psylla were detailed, and general recommendations for remedial work were given.

The paper was discussed by Messrs. Davis, Southwick, Lintner and others, both Messrs. Southwick and Lintner reporting cases of sudden appearance of the Psylla, with subsequent equally sudden disappearance.

Mr. Smith deferred speaking until the reading of his own paper which included a reference to the same insect, in which he said that the conditions described by Mr. Mariatt were identical with the conditioms obtaining in localities in New Jersey, and that the source of the introduction was also the same.

Mr. Smith then read a paper entitled "Notes of the year in New Jersey," which was a summary of the important insects brought to the attention of the entomologist during the present season. It contained references to occurrences of the Pear-tree Psylla, the Pear Blister-mite, the Pear Midge, a new pear pest in a species of Agrilus, probably *anxius*, the habits of this last insect being described at some length. The paper also considered the use of protective coverings for the trunks of trees as a means against the borer, invasions of cutworms, the Periodical Cicada, some potato insects, onion maggots, the remarkable mortality of the clover-leaf weevil larvæ, and the potato-stalk borer, *Trichobaris trinotatus*, which had been brought to his attention for the first time the present year. The paper was discussed by most of the members present.

Mr. Davis also presented a communication covering notes on special economic insects of the season in Michigan, referring particularly to the occurrence of *Diplotaxis Harperi* as a strawberry pest, a dipteron raspberry girdler, *Adimonia clavicollis* as a cherry tree defoliator, *Notoxus anchora*, as feeding on fruit of cherry.

In the discussion Mr. Hopkins stated that he had found the raspberry cane maggot described by Mr. Davis, in the Alleghany Mountains in 1892, but did not rear the adult.

In the absence of Mr. Chittenden his paper entitled "Supplementary Notes on the Strawberry Weevil, its Habits and Remedies," was read by Mr. Southwick. The writer noted the occurrence of the strawberry Weevil, (*Anthonomus signatus*, Say) in more or less injurious numbers in parts of Maryland, Virginia, Delaware, Pennsylvania, and New Jersey in 1893 and 1894. Three new food plants were discovered, the red-bud (*Cercis Canadensis*), the dewberry and raspberry and the life-cycle from egg to adult was found to extend over a period of four weeks. The methods of oviposition and of severing stems were described. A table showing by States the destructive appearances of the insects from 1871 to date is given. Under the head of remedies, the necessity of clean culture is pointed out, also the benefit that might be derived from early-blooming varieties of staminates, and of the red-bud tree as trap-crop. Kerosene emulsion and Paris green were found by experiment to be of service, but the latter gave the better results. Directions are given for the application of these insecticides, three or four sprayings being advised, beginning two or three days before first bloom. The subject of covering beds is considered, and, in conclusion, the fruit-grower is urged not to trust entirely to staminate varieties.

Mr. Smith said he had anticipated damage from this insect the present season, but so far as he had observed, it did not manifest itself in New Jersey.

In view of the lateness of the hour, the following papers were read by title only :

"Notes on the Insects of Northern Idaho," by J. M. Aldrich, Moscow, Idaho. This paper included a few notes on the principal pests of the "Pan-handle" district of Idaho, where the farming land is at an elevation of 700 to 3,500 feet, with a corresponding change in climate. The insects discussed were the Wheat Aphis, the Codling Moth, Bud Moth, Woolly Aphis, Pear-leaf Blister-mite, and the San José scale, which latter the author stated was the most dreaded insect pest, and a considerable effort was being made to prevent its spread to new localities.

"Insects of the Year," by F. M. Webster, Wooster, Ohio. Mr. Webster's paper had particular reference to the occurrence of the larvæ of *Fidia viticida*, Walsh, in vineyards, which was the important insect manifestation of the year in Ohio. It also covered the raspberry Agrilus, the strawberry Weevil, the pear tree Blister-beetle, joint worms, the Bean Leaf-beetle, and other garden and small fruit pests, such as the Grain Louse, Corn Bill-bug, and a Thrips, which is proving very destructive to onion crops. Other insects were also mentioned briefly.

"Notes from New Mexico," by T. D. A. Cockerell, Las Cruces, N.M. This paper covered numerous short notes on various insects observed in New Mexico, with a description of the climatic and other conditions characteristic of the more important natural districts of the State, and the bearing of these on the insect fauna.

"Some Experience with Mosquitoes," by Howard Evarts Weed, Agricultural College, Miss. This communication covered the result of certain experiments in the use of kerosene as a means of preventing the breeding of mosquitoes in water reservoirs on the college campus. The use of kerosene was very satisfactory, and resulted in a very marked subsidence of the mosquito trouble. The author also reports that kerosene is a very good preventive to apply to the hands or face in the case of mosquito outbreaks.

The report of the committee on nominations was presented by Mr. Lintner as follows:

President—J. B. Smith.

Vice-President—C. H. Fernald.

Secretary—C. L. Marlatt.

The report was unanimously adopted and the officers named duly elected. (By inadvertence no second vice-president was nominated or elected.) It was decided to follow the usual custom for the next meeting, and hold it on the two days preceding the meeting of the American Association for the Advancement of Science, and at the place decided upon for the next meeting of that Association. On motion, it was requested that the minutes be printed in full in "Insect Life."

After the reading and approval of the minutes of the entire session, Mr. Southwick moved that the thanks of the Association be tendered to the President and Secretary for the able and satisfactory manner in which they had discharged their respective duties. The resolution was adopted.

The Association was then declared adjourned by the President for one year.

PROFESSOR C. V. RILEY.

Every entomologist in North America will, we are confident, join with us in the expression of the deepest regret, that Professor C. V. Riley has felt compelled, owing to the impaired state of his health, to resign his position as Entomologist of the United States Department of Agriculture. The admirable work that Dr. Riley and his staff have accomplished, both in scientific and economic entomology, during the many years that he was Director of the Division, is so well and widely known that it is unnecessary to enter into any details here. There are few who possess, in so eminent a degree as Dr. Riley, scientific ability, accurate knowledge, painstaking industry, and acute powers of observation; these gifts and attainments have been abundantly manifested in the immense additions that he has made to the knowledge of insect life in all its various phases, and it would be a calamity indeed if they were withdrawn from active exercise. It is gratifying, then, to know that Dr. Riley will retain the honorary Curatorship of the Department of Insects in the United States National Museum at Washington, and that he will now devote himself to some long contemplated work of a purely scientific character. We earnestly trust that the relief from the cares and anxieties of administrative work in a Government office will speedily restore his health and strength, and that we shall see the fruits of his labors during many a year to come.

While we deplore Dr. Riley's resignation, we cannot refrain from expressing our gratification at the appointment of his successor. The authorities at Washington have shown their wisdom in conferring the vacant office upon Mr. L. O. Howard, who has been so long and so ably sharing in its duties as First Assistant. The Department is certainly to be congratulated upon having at hand a skilled and learned entomologist who possesses in every respect the varied qualifications necessary for the successful performance of so important an office. We have every confidence that the world-wide reputation now possessed by the Division of Entomology at Washington will be in no wise impaired under the administration of Mr. Howard, and we heartily wish him health, strength, and a long life for the successful performance of his arduous and important duties.—*C.J.S.B.*, *Canadian Entomologist*, June, 1894.

BOOK NOTICES.

THE BUTTERFLIES OF NORTH AMERICA: By W. H. Edwards. Third Series. Part XIII.

Another part of Mr. Edwards's magnificent work has been received, and is of particular interest to Canadian students. The three beautiful plates represent the following: Plate I., *Neominois Ridingsii*, Edw. The upper and lower sides of both sexes of the early and late forms are shown, together with the egg and pupa, and a full series of enlarged drawings illustrating the larva in all its stages. This is a Coloradan insect, and flies in the mountains at an elevation of from 5,000 to 8,000 feet. Up to the present there is no recorded instance of *N. Ridingsii* having been taken in Canada.

Plate II. shows *Chionobas Æno*, Bdl., male and female, and a variety of the male, as well as *Ch. Æno*, var. *Assimilis*, Butler, and the egg of *Crambis*, Freyer. *Æno* is an arctic species occurring with the variety in Labrador, and also in Colorado where it inhabits the loftiest mountain peaks. An interesting account of its habits is given from the notes of Mr. David Bruce, who has done a great deal to work up the life-histories of the butterflies of the Coloradan mountains. *Æno* belongs to the *Semidea* group of the genus, and has been confounded with that species and *Crambis*, Freyer. Mr. Edwards says: "It was not till Mr. Bruce explored the peaks of Colorado that it became possible to understand what *Æno* was, and the limitation of *Brucei* made clear the position of *Crambis*."

The series is now arranged as follows:

1. CRAMBIS, Freyer.
2. BRUCEI, Edw.
3. ÆNO, Bdl.
   ——— var. ASSIMILIS, Butler.
4. SEMIDEA.
5. SUBHYALINA.

Ch. Also, Bdl., Mr. Edwards rejects altogether as an American species.

Plate III. shows *Ch. Macounii*, the grand species which was discovered at Nepigon, north of Lake Superior, by Prof. John Macoun, of the Geological Survey, in whose honor it was named. *Ch. Macounii* belongs to a different group of the genus to the species mentioned above, and finds its place with *Californica* and some other large species occurring on the Pacific Coast. It is a fine insect expanding 2–2½ inches and has the remarkable feature of lacking the sexual band of androconia or special scales, which is such a striking characteristic of the males of all the other species in the genus. The plate is a very beautiful one, and shows a pale male and the full life-history with the exception of the pupa. The female figured, although of course copied from an actual specimen, is hardly typical of that sex, and it is to be hoped that at some future time Mr. Edwards will publish another illustration showing the more usual form, which has a much richer appearance both on the upper and under sides.

Ch. Macounii is decidedly a variable species, both in the intensity of the golden brown of the wings, in the amount of infuscation along the nervures, and in the size and number of the ocelli. Both sexes frequently have three ocelli on the primaries, and occasionally four. One specimen in my collection, plainly a male, has four distinct ocelli on the primaries, the second and fourth from the apex large and pupilled. In fact, this specimen has more nearly the markings of what appears to me the typical form of the females. There is also a very much infuscated variation of the male which is rarely taken, in which the nervures, are all broadly bordered and the greater part of the surface of the disk is covered with dark scales. One of these was mentioned by Mr. Edwards in his original description (*Can. Ent.*, XVII., p. 74), and was omitted from the plate now published for want of space. The life-history of this species has not yet been worked out, as no one has succeeded in obtaining the pupa. It will probably be much like that of *Ch. Chryxus;* but for the present it is unknown, and it remains for some expert and patient breeder to carry the larvæ through all their stages and obtain this missing link. The eggs are easily obtained when a female has been captured ; but the breeding is very tedious, the larval life lasting nearly two years. J. F.

MONOGRAPH OF THE NORTH AMERICAN PROCTOTRYPIDÆ : By William H. Ashmead. Bulletin of the U. S. National Museum, No. 45; pages 472; plates 18.

Every student of the Hymenoptera must be delighted at the issue of this magnificent volume, which bears most ample testimony to the extensive studies and patient industry of the author. Treating, as he does, of a family in which the American species had previously been but meagrely represented in collections, he has necessarily been compelled to describe a large proportion of the insects now recognized, and to erect a considerable number of genera for their reception. The labor involved in the critical examinations requisite for the determination and description of so many microscopic forms, and in the preparation of the voluminous text, must have been enormous, yet the author has been able to amplify and embellish his work by the delineation of some one hundred and fifty exquisite figures.

The position of the Proctotrypidæ in the order Hymenoptera is considered to be much more closely allied to some families of the Aculeata than to the Chalcididæ, with which they have been usually grouped, while they also approach in other respects the parasitic Cynipidæ. The Mymarinæ, hitherto included as a sub-family, are set aside as constituting a distinct family allied to the Chalcididæ, so that the species now contained in the Proctotrypidæ are characterized, and distinguished from the Chalcids, by the pronotum extending back to the tegulæ, and the ovipositor issuing from the tip of the abdomen. Ten sub-families are recognized, which contain about one hundred and thirty genera, represented by nearly six hundred species—a doubling of the genera and quadrupling of the species as enumerated in the catalogue of Hymenoptera issued a few years ago by Mr. Cresson. Many of the genera are known only by single species, but others contain numerous forms, the most extensive being Polygnotus (32), Proctotrypes (21), Prosacantha (27) and Telenomus (32). The synoptic tables requisite for the separation of the species in such genera, as well as the tables for the distinction of genera, etc., give evidence of great care and skill in their preparation and arrangement.

While many of the genera are apparently confined to the more southerly and westerly regions, the species in other groups have an extended range, which at times seems to be almost continental, as for instance *Proctotrypes californicus*, which has been taken at Ottawa. The members of this family have received but scanty attention in Canada, so that their distribution northward cannot be stated, but undoubtedly many interesting species could be found by a careful and patient collector in any locality. Provancher, in his Faune Entomologique, was able only to announce the occurrence of *nine* species, and about twice as many are recorded in his Additions completed just before his death. Mr. Ashmead, however, has been able to enlarge the list of Canadian species to about ninety. With the exception of three forms from Vancouver Island, the species are all from a few localities in eastern Ontario and Quebec, so that the Dominion as a whole has been practically unworked. The three western species are *Mesitius vancouverensis* and *Polymecus vancouverensis*, collected by the Rev. G. W. Taylor, of Victoria (and communicated through the writer to Mr. Ashmead), and *Anteon puncticeps*, taken by Mr. Wickham.

Although the Proctotrypids are all small, and frequently microscopic, they show great variations in structure, and their study thus becomes very interesting. A large proportion of them are egg-parasites, while others prey upon Aphididæ, Cecidomyidæ, etc. In many species (noticeably in the sub-family Bethylinæ) the females differ largely from the males in the shape of the head, antennæ and structure generally. Those of the sub-family Dryininæ have remarkable chelate, or pincer-like claws, on the anterior feet, which are probably for more firmly grasping, during oviposition, the small, active homopterous insects on which the larvæ are parasitic. Many forms are wingless or have very rudimentary wings, but they are, nevertheless, very nimble little atoms, and can leap many times their own length.

As the appearance of Mr. Ashmead's splendid monograph may stimulate some of our members to the collection and study of these insects, it may be stated that a considerable number of the species, such as Bæus, etc., may be obtained even in winter by sifting moss as it is done for small coleopetra. This habit of hibernating in the moss of swampy localities is another feature (not mentioned by the author) which separates them from the other hymenoptera known to me, with the exception, perhaps, of ants, which are also occasionally obtained in sifting. W. H. H.

The Butterfly Hunters in the Caribbees: By Dr. Eugene Murray-Aaron. New York; Charles Scribners' Sons, 1894; pp. 269.

It is a novel event in literature to have a boys' book of adventure written by an entomologist; we were, therefore, prepared to peruse with interest the volume which Dr. Murray-Aaron has just published. Belonging, perhaps, to those whom he characterizes as the "younger old people," we were charmed beyond measure with the book and read it through from beginning to end with as much avidity and enjoyment as any adventure-loving school-boy. It relates, in pleasant easy style, the expedition made by a couple of boys under the guidance of their naturalist friend "the doctor." During the early winter months they visited several of the islands of the Bahamas, and then made a more venturesome excursion across Haiti and into Santo Domingo, winding up with a flying visit to Jamaica. Their object was to collect butterflies especially, and at the same time to gather all the animal and vegetable curiosities that they conveniently could. For an account of their success and the various "dodges" they had recourse to, especially when in pursuit of *Papilio Homerus*, we must refer the reader to the book itself. It is not, however, a mere record of the doings of collectors; a great deal of interesting information is given regarding the condition of the negro races in their barbarism where left to themselves, and their happy condition when under British rule. Much pleasant instruction may also be gained regarding the geography, scenery and government of the various islands that were visited. If any paterfamilias is looking for a book to put in his boy's Christmas stocking, he cannot do better than purchase a copy of this; if his boy has any taste for natural history it will delight him beyond measure. The book is handsomely printed and bound, and illustrated with several well-executed plates The entomologist may be disappointed at the absence of lists or names of species and pictures of butterflies, but the book is not meant for a scientific treatise, though its statements may be relied upon as strictly accurate, the author being well-known as the editor for a time of *Papilio*, and Curator of the American Entomological Society at Philadelphia, as well as a valued contributor to the *Canadian Entomologist*. C. J. S. B.

Random Recollections of Woodland, Fen and Hill; and Woodside, Burnside, Hillside and Marsh: By J. W. Tutt, Editor of the *Entomologists' Record and Journal of Variation.* London: Swan, Sonnenschein & Co.

The name of the author of these two volumes must be familiar to our readers as an occasional contributor to our pages, while he is widely known as a writer of much scientific repute on matters concerning the lepidoptera. In these two books he has assumed a lighter and more popular role; his aim has been—to quote his own words—"to bring under the notice of the general public, in readable and untechnical language, a few of the interesting phenomena which are to be observed everywhere around us by those who take the trouble to look for them, and to give such explanations of their causes as may easily be understood even by those whose scientific knowledge is small." He has certainly carried out his design most successfully and given to the world two very charming and interesting books on out-of-doors natural history. Any one, whether young or old, who takes any pleasure in the beauties of nature and any interest in the varied world of animal and vegetable life, will read them with the greatest delight and follow the author with unflagging interest during his rambles over hill and dale, and by marsh and burn and fen. In the former work more attention is paid to the habits and variations of insects, while the latter treats of any animal or plant that may be met with in expeditions to widely different localities. Amusing episodes and pretty bits of verse enliven the volumes, and many capital pictures render the later one still more attractive.

C. J. S. B.

Report of the Entomological Department of the New Jersey Agricultural College Experiment Station: By John B. Smith, Sc.D., for the year 1893.

It is obviously impossible to notice all the ever-welcome bulletins and reports that constantly flow from the various experimental stations throughout North America, for copies of which we are very grateful to their authors. We may, however, call attention to Dr. Smith's excellent departure from the ordinary report. After giving the usual general review of the season, and an account of the most important insect attacks of the year, he devotes a large portion of his work to a most useful and admirable account of the "Beneficial Insects" in all the different orders. It is clearly and plainly written, so as to be within the comprehension of non-entomologists, and is profusely illustrated with excellent figures, many of them being new reproductions by means of photography. It ought to be widely distributed, in order to teach the general public that a very large proportion of insects are not noxious, and should not be wantonly destroyed. C. J. S. B.

Report of the Entomologist and Botanist (James Fletcher, F.R.S.C., F.L.S.), Central Experimental Farm, Ottawa, 1894.

Mr. Fletcher's Reports are always interesting and valuable; and the present record of the chief insect attacks of last year, and his observations upon them, is not less so than its predecessors. The season of 1893, as far as destructive insects were concerned, was only remarkable for the superabundance of locusts (grasshoppers), and the consequent damage inflicted upon oats and many other field and garden crops. Other attacks were for the most part of the familiar kinds which we have always with us; these are briefly mentioned in the Report, while more attention is paid to the serious injury caused to grain crops in Manitoba and the North West by cut-worms, the ravages of locusts, granary insects at the Chicago Exhibition, the horn-fly, etc. Very interesting accounts are also given of *Silpha bituberosa*, which attacks vegetables in the North West Territories; and *Polyphylla decemlineata*, which was very injurious to shrubs of various kinds in a nursery at Victoria, B.C.

In the Botanical section of the Report there are two papers especially noteworthy: those, namely, on "Grass for the protection of shores and harbors," and on the "Tumbleweeds" of the North West. The pamphlet is illustrated by a handsome full page picture of Mr. Fletcher's grass plots at the Experimental Farm, which are full of interest to every visitor; and thirty wood-cuts. It is gratifying to observe how steadily the author's reputation is growing, and how highly his work has come to be appreciated from one end of the Dominion to the other. C. J. S. B.

Eighth Report of the Injurious and other Insects of the State of New York for the Year 1891: By J. A. Lintner, Ph. D, State Entomologist, Albany, 1893.

Anything published by Dr. Lintner is sure to contain much valuable information and to be highly interesting, whether the subjects treated of are new to us or not. The Report before us fully supports this statement. It treats of a large number of insects, injurious or otherwise; and gives in most cases a life history of each, including the author's own observations, which are always accurate and clearly detailed. Attention may especially be drawn to the accounts of the Raspberry Geometer (*Synchlora glaucaria*), the Birch-leaf Bucculatrix (*B. Canadensisella*), and the Pear-midge (*Diplosis pyrivora*). An appendix contains some very interesting popular lectures on Economic Entomology, which are well worth perusal. The only drawback to the Report is the late date of its publication, which is more than two years after the observations recorded in it were made. C. J. S. B.

Butterflies from China, Japan and Corea: By John Henry Leech, B.A., F.L.S., etc. In parts, 4-to, 642 pp, 43 plates; R. H. Porter, London, Dec., 1892—Jan., 1894.

The fifth and last part of the letter-press of Mr. Leech's work has just been issued, and is accompanied by the statement that five plates of Hesperidæ and a supplemental plate will shortly follow, completing the work. Presumably these plates will be accompanied by the letter-press of the title page, preface and index, with which the work will be ready for the binder. As to the typography of the book, it must be said that it leaves nothing to be desired. The paper is luxuriously heavy; the type is beautifully clear and large; and the text conspicuously free from errors of a minor character, such as occasionally appear even in the most carefully edited works. The scholarship and taste of Mr. Leech and his accomplished secretary, Mr. Richard South, are reflected in the execution of the literary portions of the work. The plates, which are from drawings by William Purkiss, and are executed by chromo-lithography by William Greve, of Berlin, are without doubt the finest examples of this form of work which have as yet graced any similar publication. While a preference is by many accorded to figures lithographed and afterwards colored by hand, and the most exquisitely perfect illustrations have been produced in this way; and while the results of chromo-lithography as ordinarily employed in scientific illustrations have generally been more or less marred by striking crudities, these plates before us are most marvellous illustrations of the capabilities of the chromo-lithographic process, when employed by those who are masters of the art. The plates are almost perfect facsimiles in form and color of Mr. Purkiss's exquisite drawings; and the student of Chinese and Japanese lepidoptera may well rejoice upon having at his command such an infallible guide to specific identity as is found in these beautiful illustrations. The only adverse criticism which the mechanical and typographical execution of the work admits is on the score of the bulk of the letter press, which will necessarily be bound up in one volume. The heavy paper employed results in the production of a book which, as a manual of reference, promises to be somewhat uncomfortably "fat."

The title of the book indicates the consciousness of the author that, in our present state of knowledge, any effort to deal with the lepidopterous fauna of the great regions covered by this work must at best be attended by imperfections. There are wide areas in China in which little or no attempt has yet been made to make collections; and it must necessarily be many years before it can be asserted that our knowledge of the faunistic resources of Central Asia is complete. In his classification, Mr. Leech follows the order now almost universally recognized by writers in England and on the continent as most natural. He erects, as far as the writer has been able to observe, no new genera; and while giving us a large number of new species, appears to have pursued a conservative course in this regard, which is to be commended. To the student of Asiatic lepidoptera the work is simple indispensable, and will remain a lasting monument of the energy and scientific accomplishments of its learned and enthusiastic author. W. J. Holland.

MISCELLANEOUS ENTOMOLOGICAL PAPERS, BY F. M. WEBSTER, FEB. 1894.

We have just received a neat pamphlet of 59 pages, which forms Bulletin 51 of the Ohio Agricultural Experiment Station. It is by Prof. F. M. Webster and like all his work shows careful preparation.

The insects treated of in the first part are: The asparagus beetle, the western corn root worm, the broad striped flea beetle, blister beetles, the basket worm, the cabbage aphis and the apple leaf louse.

An interesting account of the insects which have been introduced into the State is given under the head of "Some insect immigrants in Ohio." There appears to have been two great highways which insects imported from Europe have followed: those which have entered the State at its northeastern corner and spread westward, and those from Southern Europe which have generally entered by way of the Ohio Valley and have a more or less restricted northern distribution.

In the article "Insect foes of American Cereals" the writer is evidently dealing with a subject of which he has made a special study. By patient observation and the application of practical common sense, Prof. Webster has made some important discoveries in Economic Entomology. Not the least of these is the fact recorded in this pamphlet that the apple aphis passes part of the year as an injurious enemy on wheat. Infact Mr. Webster says: "So far as my own observations go, it is more detrimental to the wheat than to the apple." This is an important discovery and will doubtless draw the attention of entomologists to this important subject of the "Alternation of Generations" among the aphides —a line of investigation which has engaged much of the time of Messrs. Riley and Howard at Washington. Speaking of remedies, Prof. Webster says: "It would appear almost visionary to advocate spraying apple orchards with kerosene emulsion in mid-winter to protect the wheat crop, but nevertheless one of the most serious enemies of young fall wheat passes its egg stage on the twigs of the apple during the winter season. I refer to the apple leaf louse, (*Aphis mali*, Fab.")

"Soon after the young wheat plants appear in the fall the winged viviparous females of this species flock to the fields, and on these give birth to their young, which at once make their way to the roots, where they continue reproduction, sapping the life from young plants . . . . though they are seldom killed outright, these infested plants cease to grow, and later take on a sickly look, and not until the aphis abandons them in autumn to return to the apple, do they show any amount of vigor. It is very seldom that the affected plants fully recover, at least in autumn; and the result must be to reduce their productiveness the following year." The eggs of the apple leaf aphis are deposited on the twigs and limbs of apple trees late in the autumn; these do not hatch until the following spring; the plant lice remain on the apple trees for two or three generations, when winged females are produced, which fly to grasses and weeds and there pass the summer. After the young wheat is up in the autumn, the lice congregate on the plants and reproduce rapidly.

The above is briefly the life history of this insect in Ohio as worked out by Prof. Webster by careful experiments which are detailed in the Bulletin. At Ottawa this probably may also, to a large extent, be the case; but the aphis is also sometimes abundant on young apple trees right through the season. It is, however, seldom injuriously abundant in Ontario, although in British Columbia it is to-day one of the most serious enemies of the apple grower.

Prof. Webster's paper will doubtless cause many other entomologists to study this insect more closely, when it is probable that further discoveries will be made, perhaps not less interesting than that now discussed.

J. F.

THE INTER-RELATION OF INSECTS AND FLOWERS.

During the last 8 years there have appeared from the pen of Mr. Charles Robertson, of Carlinville, Ill., several most interesting articles on the inter-relation of insects and flowers. The titles are as follows:

Botanical Gazette—

1886. Notes the on pollination of Asclepias.

1887. Insect relations of certain Asclepiads.

1887. Fertilization of Calopogon parviflorus.

1888. Effect of the wind on bees and flowers.

1888. Zygomorphy and its causes: I-III.

1889-93. Flowers and Insects: I-XI.

Trans. Am. Ent. Soc.—

1889. Synopsis of North American species of Oxybelus.

1891-93. Descriptions of new species of North American Bees.

Trans. St. Louis Acad. of Science—

1891-92. Flowers and Insects: Asclepiadaceæ to Scrofulariaceæ. Umbelliferæ, Labiatæ.

Mr. Robertson began in 1886 to study the visits of insects to flowers and by his persevering observations he has succeeded in collecting an enormous number of facts which he has published mostly in the *Botanical Gazette* and in the Transactions of the St. Louis Academy of Science.

He has studied the subject especially from a botanical point of view and has given particular attention to the attractions offered to insects by the flowers of different species of plants, to the peculiarities of arrangement of their different parts, to their coloration, and to the modifications which many flowers seem to have undergone from their being constantly frequented by certain species of insects.

Such studies have nevertheless an immediate bearing on entomology, as they give us at the same time an insight into the purposes of insects in visiting flowers, into their habits of feeding and collecting either nectar or pollen, or both at once, and into the intelligence they display in order to attain their end. The close attention thus necessarily given to insects, has had besides the natural result of causing Mr. Robertson to discover that many of those insects which he was observing in his locality, Carlinville, Ill., had not even been described. Therefore, he found it necessary at first to pay particular attention to collecting and determining insects. He was helped in this work by specialists in Diptera and Coleoptera, and had himself to work out and describe many species of Hymenoptera: 10 out of 14 species of *Oxybelus*, 28 out of 30 of *Andrena* and at least thirty other species of Andrenidæ. The descriptions of these have appeared in the Trans. Am. Ent. Soc., 1889-1893.

The two great agencies of cross-fertilization of flowers are the wind and insects; hence Mr. Robertson has thus been led to notice some interesting facts concerning the effect of wind on bees and flowers.—*Bot. Gaz.*, xiii., 1888, p. 33.

The first papers by Mr. Robertson are on the pollination of Ascelepias, the flowers of which are most interesting in their peculiar adaptation for cross-fertilization by the agency of insects. Their structure and the great difficulty the smaller insects have in effecting pollinations, leads Mr. Robertson to believe, "that bumble-bees have had most influence in modifying the flowers, and they are the most common visitors after the hive bees. Hive bees, it is to be remembered, do not belong to our fauna."

Our space is too limited to allow us to follow the writer into what he has observed in all the different orders and species of flowering plants studied; but the names of all the insects observed visiting the flowers, are given, as well as tabular data of the respective number of visitors of the different classes, Hymenoptera, Diptera, Lepidoptera, Coleoptera and Hemiptera. As an instance, it may be mentioned that on the flowers of *Ceanothus Americana* there were seen forty-eight species of Hymenoptera, forty five of Diptera, two of Lepidoptera, thirteen of Coleoptera, and four of Hemiptera ; and considations are given as in the case of all other blossoms treated of, on the arrangement of the flowers, their form, color and other peculiarities of structure, some of them exceedingly minute, in which close and patient observation often succeeds in discovering most wonderful purpose and design for insuring cross-fertilization.

These investigations are of great interest and we commend them to the attention of entomologists and botanists as a fertile field of useful special study. Our idea of mentioning these excellent articles of Mr. Robertson's is to draw to this subject the attention it deserves from entomologists, who from their place of publication might not be aware of their existence.

J. A. Guignard and J. Fletcher.

A PEN SKETCH OF PROF. WILLIAM SAUNDERS, F.R.S.C., F.L.S., ETC.*

By F. W. Goding, M.D., Ph.D., Rutland, Illinois.

A sketch of the life of Wm. Saunders is peculiarly instructive to young men, because of the fact that he has accomplished so much with so few opportunities in the way of a liberal education, having left school at the age of fourteen ; but by painstaking study and observation he has risen to the topmost pinacle of fame as an entomologist, horticulturist and experimental agriculturist. He was born in Crediton, Devonshire, England, June 16, 1836. At the age of twelve with his parents he removed to Canada, and two years later was apprenticed to a chemist. After learning the art he engaged in business, continuing it in London, Ont., until his recent promotion in 1886 to the Directorship of the Dominion Experimental Farms. A sa chemist and pharmacist he is well known throughout the United States and Canada, his published papers being widely copied and translated into several foreign languages. He was President of the American Pharmaceutical Association in 1877-8, while in 1874 he was elected an honorary member of the Pharmaceutical Council of Great Britain. The Canadian Government recognizing his special qualifications appointed him Public Analyst, in which capacity he did good service in detecting and exposing adulterations, especially in articles of food. He was for a number of years, preceeding his recent promotion, Professor of Materia Medica in the Medical Department of Western University in London, Ont., a position he was peculiarly qualified to fill.

Coupled with all these attainments he has others in which we are far more deeply interested. As an entomologist and horticulturist he is known to every student of either branch, and to mention all the things accomplished by him in these departments would require far more space than is allotted to this paper. He began the study of botany some thirty-five years ago, publishing the first list of plants found in Western Ontario, embracing 545 species, in 1863. Some time prior to this he captured a fine specimen of *Papilio turnus* (in 1859 or 60) and found it possessed of so many beauties that he was led to look for others. From this chance occurrence he was directed to the study of insects in general, and as an entomologist is considered second to none in point of eminence. At the time of the organization of this society, in 1863, he took an active part, and much of its present flourishing condition is due to his careful management as President, a position he occupied during the greater part of its existence. While editor of the *Canadian Entomologist*, the only entomological magazine ever published in America that has been able to live to attain its majority, he was also one of its principal contributors, his articles published therein and in your society reports reaching many hundreds. The

*This account of the life of Prof. Saunders, whose portrait is prefixed to this Report, was written two or three years ago, and will be read with interest as conveying the impressions of a foreigner, who cannot be charged with the partiality of intimate friendship.—Ed.

crowning work of his pen, however, is his "Fruit Insects," a magnificent volume of 436 pages, which has reached the second edition. The book has been received all over the world as the most valuable work of the kind ever published. One reviewer says of the book :

"We do not think that we are speaking too highly in praise of the work—though we admit it is saying a great deal—when we express our opinion that Mr. Saunders's volume will take rank with that standard of excellence, Harris's injurious insects of Mass., and that he has done for insects affecting fruits at the present day what his justly famed predecessor accomplished long ago for those injurious to vegetation in general."

It appears that the work was just what was wanted from the immense sale of it, about 2,500 copies having been sold. This seems all the more strange when it is stated that the average circulation of entomological works rarely exceeds two or three hundred copies.

Since 1867 he has been a director of the Fruit Growers' Association of Ontario, and its president since 1882. In his experimental grounds he has tested a great variety of fruits, laboring constantly to ascertain which are best adapted to the climate of Canada. In this manner he has, by experiments in cross-fertilization, obtained several good raspberries, gooseberries and grapes. His interest in horticulture and forestry has prompted him to become familiar with these important departments and caused him to awake general interest in these matters in the province in which he lives.

A special commission was appointed by the Government of Ontario, in 1880, to inquire into the progress and condition of agriculture in the Province. As one of the commissioners, Mr. Saunders was charged with the special duty of inquiring into the subjects of fruit growing and forestry, insects and insectivorous birds, and bee-keeping. In his report, published in a large 8vo volume of over 850 pages, he treats each of these subjects as one familiar with them, leaving no topic to be hereafter completed.

As a result of this careful inquiry into the agricultural condition of the Province, the Government caused to be purchased large tracts of land located in the various Provinces, to be known as the Experimental Farms, which were fitted up with all modern appliances and buildings, properly stocked, and then placed Prof. Saunders in charge as Director. Probably nowhere in the Dominion could be found a man so well qualified, by education, tastes and executive ability, as he, to be placed in this responsible position. Already this institution has taken a front rank among similar ones and under Prof. Saunders's charge is destined to become second to none.

Prof. Saunders's services have been recognized in various ways. Some years ago he received from the Duke of Mantua and Montserrat a handsome gold medal in acknowledgment of valuable services in the interests of natural science. He is Fellow of A.A.A.S. ; of Linnean Society of London, and of Royal Microscopical Society of London, England ; one of the twenty original members of the Royal Society of Canada ; Corresponding Member of American Entomological Society ; Natural History Society of Montreal ; Buffalo Society of Natural Science, etc., etc.

He was married August 1st, 1857, to Sarah Agnes, daughter of Rev. J. H. Robinson, of London, Ontario. They have six children, one daughter and five sons. Several of the latter have inherited the tastes of their honored sire, and are working their way into public favor.

Prof. Saunders is five feet ten inches in height, with a symmetrical figure, and weighs about 175 pounds. His hair is dark brown, his eyes blue. He is one of the most approachable of men, with a look of kindness ever beaming from his genial countenance, yet with a quiet dignity which forbids familiarity.

And now our pleasant task is done. Prof. Saunders at last has found a sphere in which his broadly developed abilities have ample space in which to labor. And here we leave him with the agricultural eyes of Canada ever upon him, awaiting developments that are sure to come and wholly for their interests.

OBITUARY.

The Late Dr. Hagen.

Hermann August Hagen was born May 30, 1817, at Konigsberg, in Prussia. His parents were Carl Heinrich Hagen, Professor of Political Economy, Technology and Agriculture at the University of Konigsberg, and Anna Dorothea Linch. His first instruction was received at the gymnasium "Collegium Friedericianum," whence he was transferred in 1830 to the "Kneiphofische Gymnasium." He graduated in 1836, studied medicine at the University of Konigsberg and received the degree of Doctor of Medicine in 1840. After the death of his grandfather, Carl Gottfried Hagen, Professor of Natural History in Konigsberg, the latter's entomological collection and library came into the possession of the grandson. Under his father's direction he studied entomology in his leisure time, collecting chiefly Odonata, because by chance the first specimen he caught proved to be an undescribed insect of that order. While he became gradually more interested in this particular study, he had the benefit of some instruction from two eminent and still active naturalists, Theodor von Siebold and Carl Ernst von Baer, who called his attention to the necessity of the study of medicine for the naturalist, the knowledge of pathology being indispensable to a comprehension of any normally constituted organism. He attended also for several years the lectures of Professor Rathke, the celebrated embryologist, and accompanied him in 1839 on his scientific journey through Norway, Sweden and Denmark, studying chiefly the anatomy and habits of marine animals. In 1840, he published at Konigsberg, as a dissertation for the degree of Doctor of Medicine, a little work entitled "Synonymia Libellulinarium Europaeorum." From 1840-1 he studied at the University of Berlin and passed, according to the law of Prussia, the necessary examinations as physician and surgeon. He then travelled through the greater part of Europe. In Vienna he attended clinical and medical lectures for six months, and in Paris for nearly a year. The study of natural history was in the meantime always pursued, so far as time and circumstances allowed, and his acquaintance with Baron de Selys-Longchamps, of Liege, made in Paris, 1842, gave rise to a series of entomological publications containing their combined studies of the family of the Odonata. He was favored at this time with the counsel and encouragement of the prominent entomologists, Klug, Erichson, Kollar, Von Siebold, and many others whose personal acquaintance he had made during his travels. He returned to Konigsberg in 1843, and settled there as a practising physician. For three years he was first assistant at the surgical hospital, performing the greater part of the operations. In 1851 he was married to Johanna Maria Elise Gerhards. His duties as a physician limiting his studies in natural history to leisure hours, he confined himself to entomology (with especial reference to the Neuroptera), entomological biology, and the study of the microscope. The fear of wasting time in investigating subjects which had already been elucidated induced him to catalogue carefully all accessible entomological publications. This compilation, begun for his own use, was afterwards published as "Bibliotheca Entomologica," in two volumes, Leipzig, 1862. Alone, or jointly with Baron de Selys-Longchamps, he has published in various scientific periodicals a large number of notes, papers and monographs, all of which, up to 1861, are mentioned in his "Bibliotheca." His first publication was made in 1834, on "Prussian Odonata." It was his wish to prepare monographs in all families belonging to the Linnæan Neuroptera, but circumstances did not permit the full execution of this plan. In 1849, 1857 and 1861 he made extended scientific journeys through Germany, Belgium, Holland and England for the sake of comparing collections and libraries. From 1863-67, his official duties as Vice-President of the City Council and Member of the School Board of the City of Konigsberg left him no leisure. A large number of reports on a great variety of subjects relating to these duties demanded much careful study. Some of them, as for instance one on "Life Insurance," are exceedingly elaborate treatises. In 1863 he received the honorary degree of Doctor of Philosophy from the University of Konigsberg.

He was corresponding or honorary member of a large number of learned societies. In 1867 Professor Agassiz invited him to come to Cambridge as assistant in entomology, and in 1870 he was appointed Professor of Entomology in Harvard University.*

" Dr. Hagen entered upon his duties at the Museum with great zeal ; and his detailed plan for the arrangement of the collections, though somewhat modified, is, and is likely to remain, the basis for the future. Deeply interested in everything relating to museum work, as his appreciation of series of specimens, his care for their preservation and for the accuracy of their localities, and many minor details, clearly indicate, it is in this collection as well as in his writings that his contributions to science are to be found. Here alone we can fully realize the extent of his discoveries, the keenness of his insight, his skill at preparation and dissection, and with the pencil. His devotion to the Museum knew no bounds ; all personal interests were secondary. In 1876 he refused a most flattering and urgent invitation to take charge of the great entomological collections of the Konigliches Museum für Naturkunde in Berlin, and the time that might have been given to original work was lavished upon the care and arrangement of the collections, which grew rapidly both in size and value. The biological collection, or that illustrating the life history of the species, is a prominent specialty of the Cambridge Museum. In this are preserved specimens showing every condition of an insect's life, the eggs, larvæ in all stages, from those just hatched to those full-grown, their burrows, nests, partially devoured leaves, etc., the work of both larvæ and adults, the frass or excrements often of great importance, pupal stages, adults of both sexes, and the parasitic and predaceous enemies, also in all stages of development. Dr. Hagen's influence upon the formation of such biological collections has been very great ; few were in existence at the time when, almost unaided, he created that at Cambridge, and the care and elaborateness with which the whole is labelled makes it not only a worthy model, but most truly a monument to persistent and well-directed industry.

" His lectures, given at rare intervals to advanced students, contained much genuine and exact knowledge, and his many acts of kindness and words of wise counsel will not soon be forgotten by those who enjoyed the facilities of the Department under his charge.

" Most of Dr. Hagen's journeys were undertaken for study among collections and in libraries. In the summer of 1882, however, accepting the generous and thoughtful invitation of Professor Raphael Pumpelly, at that time Director of the Northern Transcontinental Survey, he visited California, Oregon, Washington and Montana. The object of the survey was to collect data concerning insects injurious to vegetation, both of the field and of the forest. The greater part of the time was spent in the Yokima and Columbia regions of Washington ; many important entomological discoveries were made, some with a direct economic bearing, and large collections of insects were obtained from a most interesting locality.

" Dr. Hagen was a man of marked character, simple and sympathetic, and if at times somewhat hot and hasty in temper and impatient of opposition, he had also one of the warmest of hearts and most generous of dispositions. His unostentatious hospitality was enjoyed by many entomologists, who found his life in Cambridge quiet, contented and happy.

" Of Dr. Hagen's domestic life it is sufficient to record here that in 1851 he married Johanna Maria Elise Gerhards, who survives him.

" Dr. Hagen received the honorary degree of Doctor of Philosophy from the University of Konigsberg in 1863. Harvard made him a Doctor of Science in 1887. The renewal of his medical degree on the 17th of October, 1890, the date of his graduation fifty years previously, after the custom of German Universities, gave him great pleasure. He was elected a fellow of the American Academy of Arts and Sciences, November 11, 1868, and served on the Council in 1877-78. He was also a member of a goodly number of scientific associations and most of the entomological societies the world over were glad to enroll him as an honorary member.

* From " Biographies " following Thomas S. Cary's sketch, " The Museum of Comparative Zoology," in The Harvard Book, by F. O. Vaille and H. A. Clark. Cambridge, 1875, Vol. I., p. 345-346, with portrait.

"Stricken with paralysis in September, 1890, Dr. Hagen lingered for more than three years; his painful sufferings being lightened by all that affectionate and devoted care could do. He died at Cambridge, Mass., November 9, 1893, and was buried in the grounds of Harvard University, at Mount Auburn, near his associate, Louis Francois de Pourtalès." (Samuel Henshaw, in the Proceedings of the American Academy of Arts and Sciences, Vol. xxix., 1894.)

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