REPORT

OF THE

Canadian Dairymen's Association,

WITH TRANSACTIONS AND ADDRESSES OF THE ANNUAL MEETING, LIST OF MEMBERS, REPORTS OF FACTORIES, AND OTHER PAPERS OF VALUE AND INTEREST,

FOR THE YEAR 1872:

TO WHICH IS ADDED, BY PERMISSION, THE ADDRESS OF PROF. GEO. C. CALDWELL, BEFORE THE AMERICAN DAIRYMEN'S ASSOCIATION.

ILLUSTRATED.

PUBLISHED BY THE ASSOCIATION.

TORONTO:
PRINTED BY HUNTER, ROSE & CO., KING STREET WEST.
1872.

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PREFATORY REMARKS.

We have great pleasure in presenting to the Dairymen of Canada, and to the general public, the Report of the Fifth Annual Convention of the Canadian Dairymen's Association. The Executive Committee spared no pains to make the Convention a success, by arranging an interesting programme, and by securing the services of men of marked ability to explain, on scientific principles, the ordinary, as well as the exceptional results of dairying operations. The Report will, doubtless, therefore, be found replete with valuable information, and if the questions therein discussed, and the facts therein explained be read with that careful thought that their importance demands, the result must needs be profitable to all. It will be more especially profitable to that class of the community for whose benefit it is more especially published.

It is pleasing to witness the increasing interest which is being manifested by dairymen in the deliberations of the Association. When men will travel far, and incur expense, and suffer hardship to attend the Annual Convention, it shows how keenly they appreciate the advantages and realize the benefits accruing from such cooperative societies. Dairymen are everywhere awakening to the importance of profiting by each other's experience and of utilizing the results of every scientific analysis. They realize the fallacy of the expression: "The farmer needs not the help of science." They feel that every year they have to contend with a keener com-

petition, that the taste of the consumer is gradually becoming more fastidious, that other sections of this continent enjoy greater facilities of transport and manufacture, and that those who would succeed in the face of these difficulties must be keenly alive to every improvement: they must avail themselves of every appliance and discovery that the progress of the age has cast within their reach. Great progress is seen in the past few years in developing and perfecting this important branch of Canadian industry. The factory system is being extended, many new factories have been erected, cheaper and better modes of mannfacture have been introduced, difficulties have been met and overcome, peculiarities of the markets are better understood, and the general character of Canadian cheese materially elevated. Who shall say but that these great results are owing largely to the discussions, explanations and publications of this Association? But this Association is yet in its infancy, and its future usefulness is but faintly foreshadowed. There is yet much to be accomplished before Canadian products stand first in the markets of the world; there are many things to be learned before dairying can be said to have reached perfection in this country. But if the success of the past be taken as an earnest of the future, we have nothing to fear, and everything to encourage.

In regard, more particularly, to the subject matter of the Report we would ask from a discerning public, a careful perusal of the addresses of Prof. Arnold and X. A. Willard, Esq., also of Prof. Caldwell's lecture, which we have extracted by permission from the report of the American Dairymen's Association for 1871.

We have embodied in this Report the answers to certain questions—answers which were required from those who took prizes at

the cheese fair held at Ingersoll in September last. These answers comprise the experience of some of the best dairymen of Canada, in regard to the most important points of cheese manufacture.

We have still to deplore the negligence of many of the proprietors of factories in not sending in condensed reports relative to their products for the past year. Our condensed Report for 1871 is far from being complete, and but imperfectly represents the actual extent and importance to which the dairy interests have now attained. Would the proprietors of the different factories kindly lend their aid in this matter, and let all have their reports ready to hand in to the Secretary at the next Convention.

We regret that this report should have reached the members of the Association so late in the season. The manuscript was early in the hands of the printer, but owing to a strike among the workmen it could not be published sooner.

J. H. BELL, A. M.,
SECRETARY.

INGERSOLL, Ont.,
April, 1872.

AN ACT

TO

Protect Butter and Cheese Manufacturers.

ASSENTED TO 4TH MARCH, 1868.

WHEREAS it is expedient and necessary to encourage and protect Butter and Cheese Manufacturers in this Province: Therefore, Her Majesty, by and with the advice and consent of the Legislative Assembly of Ontario, enacts as follows:—

1. Whosoever shall knowingly and fraudulently sell, supply, bring, or send to be manufactured to any cheese or butter manufactory in this Province, any milk diluted with water, or in any way adulterated, or milk from which any cream has been taken, or milk commonly known as "skimmed milk," or whoever shall keep back any part of the milk known as "strippings," or whoever shall knowingly and fraudulently sell, send, bring, or supply milk to any Cheese or Butter Manufactory that is tainted or partly sour from want of proper care in keeping pails, strainers, or any vessel in which said milk is kept, clean and sweet, after being notified of such taint or carelessness, either verbally or in writing; or any butter or cheese manufacturer who shall knowingly and fraudulently use, or direct any of his or her employés to use for his, her, or their individual benefit, any cream from the milk brought to any Cheese or Butter Manufactory without the consent of all the owners thereof, shall, for each and every offence, forfeit and pay a sum not less than one dollar nor more than fifty dollars, in the discretion of the presiding Justices before whom the case shall be heard.

2. Any two or more Justices of the Peace, having jurisdiction within the locality where the offence has been committed, may hear and determine such complaint upon the oath of one or more credible witnesses, and shall have power, in case the penalty awarded by them be not forthwith paid upon conviction, to levy the same by distress and sale of the goods and chattels of the

offender by warrant under their hands and seals, or the hands and seals of any two of them, and the penalty, when recovered, shall be paid over by such Justices, one-half to the person complaining and one half to the Treasurer of the Municipality, District or place where the offence shall have been committed; and in default of payment or sufficient distress, the offender may, by warrant signed and sealed as aforesaid, be imprisoned in the Common Gaol for a period not less than one day nor more than twenty days, at the discretion of such Justices, or any two of them, unless such penalty, costs, and the charges of commitment be sooner paid.

3. Any party aggrieved by such fraudulent conduct as aforesaid may, at his or their election, sue the offender in any Civil Court of competent jurisdiction and recover from him the amount of damages sustained, and levy the same with the costs according to the ordinary practice of the Court in which such suit shall be brought.

4. Provided always, that no Justice or Justices having any pecuniary interest in any such Butter or Cheese Manufactory, as aforesaid, shall hear or determine any such complaint.

5. In case of summary proceedings under this Act, any person, complainant or defendant, shall have the right of appeal as provided in chapter one hundred and fourteen of the Consolidated Statutes of Upper Canada.

ARTICLES OF ASSOCIATION.

WHEREAS it is deemed expedient to form a Canadian Dairymen's Association, through which, as a medium, results of the practical experience of Dairymen may be gathered and disseminated among the dairying community, therefore be it

Resolved,—That we, the undersigned, do hereby associate ourselves together for mutual improvement in the science of cheese-making, and more efficient action in promoting the general interests of the dairy community.

Article 1st.—The name of the organization shall be "The Canadian Dairymen's Association.

Article 2nd.—The officers of the Association shall consist of President, Vice-Presidents, Secretary, and Treasurer.

Article 3rd.—The President, Vice-Presidents, Secretary, and seven other members appointed at each annual meeting, shall constitute the Executive Board of the Association.

Article 4th.—The officers of the Association shall be elected at each regular annual meeting, and shall retain their offices until their successors are chosen.

Article 5th.—The regular Annual Meeting shall be held on the First Wednesday in February in each year, at the town of Ingersoll, Ontario.

OFFICERS OF THE ASSOCIATION FOR 1872.

PRESIDENT.

THOMAS BALLANTYNE, Esq., of Downie.

VICE-PRESIDENTS.

J. W. SCOTT, Lobo.
ROBERT WOBBER, West Zorra.
W. S. YATES, Belleville.
H. S. LOSEE, Norwich.
J. LONG, Muskoka.
O. S. PHILLIPS, Newmarket.
E. V. BODWELL, M.P., Mount Elgin.
W. F. CLARKE, Guelph.
J. S. PIERCE, Tyrconnell.
JAS. HARRIS, Ingersoll.
LUKE HAGLE, Arkona.
HON. O. BLAKE, Waterford.
DR. CLINE, Belmont.
JOS. ELLIOTT, Peterboro'.
X. A. WILLARD, Little Falls, N.Y.
W. FOWLER, Clinton.
JOSEPH HUNT, Morpeth.
L. B. ARNOLD, Ithica, N.Y.
J. P. DUNN, Dorchester.
JOHN ADAMS, Nissouri.

SECRETARY.

J. H. BELL, Ingersoll.

TREASURER.

C. E. CHADWICK, Ingersoll.

LIST OF MEMBERS

OF THE

Canadian Dairymen's Association

FOR THE YEAR 1872.

Name.	Address.
Andrew, Philip,	Avon.
Anderson, Archibald G.	Wyoming.
Atkins, John,	Putnamville.
Atkinson, Francis,	Embro'.
Agur, Robert,	Ingersoll.
Abernathy, William,	Embro'.
Avery, Daniel,	Ingersoll.
Anderson, William,	Woodstock.
Ballantyne, James,	Sebringville.
Burdick, S. S.,	Goresend.
Burdick, J. N.,	Nilestown.
Bell, Matthew,	Springford.
Bell, J. H.,	Ingersoll.
Bockett, Peter,	Fenwick.
Brand, David,	Hillsboro'.
Blinn, William,	London.
Brown, John E.,	Nithburg.
Blair, John,	Embro'.
Bixel, M.,	Ingersoll.
Butler, John,	Mount Elgin.
Birdsall, W. M. H.,	Cambro'.
Bungay, L. F.,	Norwich.
Book, G. H.,	Bookton.
Browett, Jas.,	Ingersoll.
Baker, F. A.,	St. Catharines.
Ballantyne, Thomas,	Sebringville.
Beveridge, Thomas,	Keyser.
Bacon, G. S.,	Bloomsburg.
Barnes, Barney,	Ingersoll.
Barry, Bell E.,	Harrietsville.
Barber, Geo. W.,	Villanovia.
Buckland, Prof. (Bureau of Agriculture)	Toronto.
Bobier, Alfred,	Aylmer.
Bloor, George,	Ingersoll.
Brown, Nelson,	Springford.
Brown, Walter L.,	Aylmer.
Bobier, Joshua,	Ingersoll.
Bodwell, E. V., M. P.,	Mount Elgin.
Bughner, Ebenezer,	Acacia.
Bird, James,	Halloway.
Campbell, Peter,	Bayfield.
Collett, Martin,	Toronto.
Caswell, E.,	Ingersoll.
Chadwick, C. E.,	Ingersoll.
Chalcroft, Mark,	Ingersoll.
Carroll, A. H.,	Seaforth.
Cleverdon, S.,	Kerwood.
Caister, Miss S.,	Tavistock.
Cohoe, J. W.,	Norwich.
Clark, Armond,	Ingersoll.
Cassedy, Charles,	Mount Elgin.
Crawford, W. C. A.,	Ingersoll.
Craig, John,	Woodstock.
Couse, John E.,	St. Thomas.
Copeland, Geo.,	Aylmer.
Capstick, William,	Putnam.
Cline, David,	Belmont.
Carroll, R. H.	Ingersoll.
Carter, G.,	Park Hill.
Cadman, Charles,	Ingersoll.
Collins, Josiah,	Mount Elgin.
Cook, Simeon,	Ingersoll.
Clarke, W. F.,	Guelph.
Craik, James,	Putnamville.
Chisholm, John,	Brownsville.

Name.	Address.
Dempsey, Daniel,	Fairview.
Dennis, J. W.,	Harrietsville.
Dewel, J. C.,	Reynole Basin, N.Y.
Dyson, William.	London.
Davis, A. J.,	Aylmer.
Davis, Joel W.,	Aylmer.
Dager, Daniel,	Mount Elgin.
Dibb, Richard,	Derwent.
Dibb, John,	Derwent.
Dodge, Jessie,	Dornock.
Dow, John W.,	Stratford.
Deppist, George,	Milverton.
Dundas, John,	Putnam.
Dunn, J. P.,	Harrietsville.
Douglas, William,	Ingersoll.
Davis, J. M.,	Orwell.
Daily, P. R.,	Belleville.
Dodge, Heman,	Woodstock.
Ellis, William A.,	Culloden.
Elliott, James,	Brownsville.
Elliott. James,	Peterboro'.
Elliott, Samuel,	Ingersoll.
Elliott, J. M.,	Mount Elgin.
Elliott, David,	Mount Elgin.
Evans, John,	Harrietsville.
Ellis, John E.,	Toronto.
Facey, Robert,	Harrietsville.
Frank, Joseph,	Harrietsville.
Fullerton, Matthew,	Lyons.
Francis, William,	Fullarton.
Frazer, Alexander,	Beachville.
Fierheller, Cirus,	Ingersoll.
Freeman. J. D.,	Brownsville.
Faulds, Andrew N.,	Harrietsville.
Fearman, Chester,	Ingersoll.
Frenside, John,	Beverly, Troy
Fretaz, M. C.,	Whitevale.
Forsyth, Elijah,	Fairfield Plain.
Fryfogel, Miss Lizzie,	Shakespeare
Fowler, W. O.,	Clinton.
Farrington, H.,	Norwich.
Farrington, S. A.,	Yates Co., N. Y.
Galloway, George,	Ingersoll.
Golding, Edward,	Thamesford.
Griere, Thomas,	Sebringville.
Gunn, John,	Embro'.
Gray, W. A.,	Granville, N.S.
Grane, Henry,	Dermont.
Gillard, William,	Springford.
Gilmore, David,	Nilestown.
Gardiner, Robert,	Farquhar.
Galiver, Henry,	Ingersoll.
Green, P. H.,	Sheffield.
Gane, W. H.,	Ingersoll.
Hagle, Luke,	Arkona.
Hill, G. C.,	Ingersoll.
Harrington, Paul,	Woodstock.
Hankins, Thomas,	Embro'.
Huffman, Charles,	Kelvin.
Hartley, Caleb,	New Durham
Harland, Edwin,	Guelph.
Hoover, P. R.,	Whitevale.
Hope, Thomas,	Crumlin.
Hopkins, Benjamin,	Brownsville.
Hamilton, Geo.	Cromarty.
Harris, Warren,	Ingersoll.
Huxley, William,	Ingersoll.
Hall, C. P.,	Ingersoll.
Hazelton, Cunham,	Villanovia.
Hadcock, Peter,	Mt. Elgin.
Hickson, J.,	Seaforth.
Harrington, Jacob,	Woodstock.
Hunter, E. A.	Culloden.
Holcroft, M. B.,	Ingersoll.
Hopkins, H. P.	Ingersoll.
Harris, Geo. H.,	Ingersoll.
Harrington, Walter M.,	Strathallan.
Hadcock, Isaac,	Mt. Elgin.
Harris, Geo. P.,	Mt. Elgin.
Harris, Geo. M.,	Mt. Elgin.
Huffman, Paul,	Kelvin.
Hopkins, Edward,	Brownsville.
Hidebrand, J. George,	Stratford.
Harris, William,	Mt. Elgin.
Ireland, James,	Ingersoll.
Ingram, William,	Ingersoll.
Janes, R. A.	Ingersoll.
Jarvis. Jonathan,	Ingersoll.
Johnson, D. D.,	Lobo.
Jopling, J. G.,	Port Hope.
Johnson, S. S.,	Clinton.
James, James A.,	Culloden.
Jarvis, James,	Ingersoll.
Jenks, George,	Sheffield.
Jenvey, Charles,	Springford.
Karn, David,	Ingersoll.
Kerr, John,	Ingersoll.
King, William Scott,	Ingersoll.

Name.	Address.
Kinsley, O. F.,	Humberstone
Kingston, C. J.,	Warwick.
Lane, James B.,	Dorch'sr St'n
Lewis, E.,	Ingersoll.
Losee, S. H.,	Norwich.
Longfield, George,	Putnamville.
Lang, Robert,	Rodgersville.
Lane, William P.,	Culloden.
McKay, John W.,	Fingall.
McWilliams, Donald,	Wallaceton.
Meadows, Charles,	Brooksdale.
Mabee, O. P.,	Tilsonburg.
McPherson, John,	Embro'.
McGorlick, James,	Ingersoll.
Morey & Rothwell,	Ingersoll.
Manning, L.,	Derwent.
Manning, J. G.,	Belmont.
Moulton, William,	Brownsville.
Malcolm, Andrew,	Rodgersville.
Marlock, William,	Tavistock.
Manning, Richard,	Exeter.
Moulton, John,	Verschoyle.
Moller, John,	Tavistock.
McDirmid,—	Sparta.
McBane, N.,	St Thomas.
More, A. B.,	Otterville.
Mugan, M, D.,	Woodstock.
McIntosh, Robert,	Springfield.
McKee, Alexander,	Teeswater.
McKee, Robert,	Belmont.
McLean, Allen,	Ingersoll.
McDonald, Robert,	Ingersoll.
Meek, Peter,	Ingersoll.
McIntyre, James,	Ingersoll.
Moore, James B.,	Holbrook.
Meadows, Francis,	Woodstock.
Mountain, J. H.,	Dorchester.
Munro, Angus,	Embro'.
McKenzie, George,	Dornock.
McCartney, Robert,	Brucefield.
Nancekwell, Thomas,	Ingersoll.
Noxon, James,	Ingersoll.
Noxon F. C.,	Ingersoll.
Norton, F. D.,	Nilestown.
Niles, W. H.,	Nilestown.
Oliver, Adam, M. P. P.	Ingersoll.
Ormiston, Thomas,	Kimbell.
Ostrander. Henry,	Acacia.
Park, Archibald,	Ingersoll.
Prouse, Thomas,	Ingersoll.
Philips & Bros,	Newmarket.
Partlo, John,	Ingersoll.
Phelan, D.,	Ingersoll.
Philips, James,	Ingersoll.
Park, Peter E.,	Caistorville.
Piggot, Edward,	Widder St'n.
Pearce, J. S.,	Tyrconnell.
Philips, George,	Woodstock.
Pendleton, H. S.,	St. Thomas.
Reid, Mrs. Nancy,	Milton.
Richardson, John,	St. George.
Reid, Alex.,	Ingersoll.
Richardson, William,	Ingersoll.
Rowal, John,	Nilestown.
Rouse, James,	Harrietsville.
Rimph, Jerome,	Tilsonburg.
Ryan, Richard,	Culloden.
Buckle, John,	Culloden.
Robertson, W. Scott,	Seaforth.
Richardson, Lewis,	Keyser.
Rogers, R. Y.,	Grafton.
Risdon, J.,	Wallacetown.
Ransicle, Geo.,	Onondaga.
Schell, Warren H.,	Ingersoll.
Smith, C. F.,	Belleville.
Smith, Prof. A.	Toronto.
Spears, R. A.,	Caistorville.
Spikings, J. S.,	Duncan.
Sage, Willard,	Nilestown.
Sanders, John,	Tyrconnell.
Stinson. Augustus,	St. George.
Shaw, John, T.,	Ridgetown.
Summers, Robert,	London.
Schooag, Christian,	N. Hamburg.
Sutherland, L.,	Dornoch, Oxford.
Sweet, John,	Orwell.
Small, Francis,	Holbrook.
Scidmore. R. P.,	Acacia.
Sackrider, John,	Newark,
Stonehouse, William,	Aylmer.
Sherlock. James,	Thamesford.
Smith, Samuel,	Norwich.
Street, Joseph,	Morpeth.
Schuler, Hiram,	Simcoe.
Smith, Nicholas,	Ingersoll.
Sorley, C. H..	Ingersoll.
Straith, Peter,	Clinton.
Sage, Nelson,	Nilestown.

Name.
Shirley, George
Sharon, F. H.
Smith, Benjam
Silverthron, M
Sharmon, John
Stewart, Peter
Small. William
Sager, James,
Smith, Henry
Shaw, Angus,
Sharon, H. H
Smith, John
Thormicroft
Termant, Jam
Titus, H. H.,
Tulluck, Will
Tist, George,
Tuft, James,
Timbarn. Jol
Toolin, R.
Upper, Geo.
Vanderwater
Vickers & Jo
Wade, Henry

Name.	Address.
Shirley, George,	Waterford.
Sharon, F. H. A.,	Frome
Smith, Benjamin,	Fairfield Plain.
Silverthron, Morgan,	Otterville.
Sharmon, John Jr.,	Stratford.
Stewart, Peter,	Hampstead.
Small. William,	Holbrook.
Sager, James,	Troy.
Smith, Henry K.,	Phillipsburg.
Shaw, Angus,	Lakeside.
Sharon, H. H.,	Frome.
Smith, John H.,	Embro'.
Thormicroft M.,	Lamberth.
Termant, James,	Carnsville.
Titus, H. H.,	Otterville.
Tulluck, William Rose,	Mosley.
Tist, George,	Brownsville.
Tuft, James,	Welland.
Timbarn. John N.,	Lisbon.
Toolin, R.	Belmont.
Upper, Geo. A.,	Jarvis.
Vanderwaters, D.,	Belleville.
Vickers & Johnson,	Speedie.
Wade, Henry,	Port Hope.
Weed, Joseph,	Watford.
Wood, James,	Glenmorris.
Weekes, Thomas,	Temple.
Wilson, John,	Ridgetown.
Watson, W.,	Ingersoll.
White, David,	Ingersoll.
Wilkinson, William,	Ingersoll.
Wilmott, T. H.	Milton.
Williams, J.,	Nilestown.
Weld, W.,	London.
Wild, W. G.,	Clinton.
Walker, Hiram,	Dornock.
Williams, Dr.,	Ingersoll.
Ward, Sheldon,	Arnold.
Whyte, John,	Cromarty.
Webber, Robert,	Strathallan.
Whitett, R. C.,	Birkall.
Woodard, John C.,	New Durham
Wallace, William,	Harrietsville.
Weir, John, B.,	Crumlin.
Yorke, Jehiel,	Union.
Yates, W. S.,	Belleville.
Yorke, Edward,	Brownsville.

CONDENSED REPORT.

The following Table gives the number of Cheese made, average weight, size, total weight, and the average quantity of Milk to a pound of Cheese from the Factories that have sent in full Reports :—

Name of Factory.	Post Office.	No. of Cheese made.	Average Weight.	No. of inches in diameter.	No. of lbs. of Cheese.	No. lbs. of Milk to lb. of Cheese.
Brownsville	Brownsville	6672	70	16	467,985	$9\frac{95}{100}$
Yarmouth Centre	Yarmouth Centre	550	76	$16\frac{1}{2}$	41,800	$9\frac{76}{100}$
Grafton	Grafton	2804	66	16	185,099	$9\frac{92}{100}$
Northwood	Aylmer	1232	73	16	89,936	$9\frac{7}{8}$
Sager's	Troy	811	70	16	64,770	10
Cornell's	Washington	818	65	16	53,158	$10\frac{1}{2}$
Hornby	Hornby	226	45	15	8,859	10
Smith's	Simcoe	1000	68	16	68,000	$10\frac{1}{6}$
Maple	Warwick	914	71	16	65,163	$10\frac{3}{10}$
Newmarket	Newmarket	850	60	16	51,000	$9\frac{8}{10}$
Bear Creek	Birkhall	600	60	15	36,000	10
Culver's	Bloomsburg	421	68	16	28,658	10
Forest	Forest	500	70	16	35,000	10
Deppisch's	Milverton	370	70	16	29,945	10
Springford	Springford	1440	70	16	100,800	10
Avon	Avon	1750	74	$16\frac{1}{2}$	129,386	$9\frac{67}{100}$
Culloden	Culloden	2310	75	...	173,246	$9\frac{8}{10}$
Rose	Bridgenorth	216	55	16	11,862	.....
Otterville	Otterville	286	63	$16\frac{1}{2}$	18,072	$10\frac{1}{8}$
Londesborough	Clinton	1100	62	15	68,226	$10\frac{26}{100}$
Collin's	Mount Elgin	900	70	16	63,000	10
Mugan's	St. Thomas	886	71	16	63,027	$10\frac{18}{100}$
"	"	634	70	16	44,380	$10\frac{2}{10}$
Northport	Northport	2120	56	15	118,720	$9\frac{1}{2}$
West End	Clinton	960	55	15	52,800	$10\frac{1}{2}$
	Wyoming	525	69	16	36,236	$9\frac{3}{5}$

Springford	Springford					
Avon	Avon	1750	74	16½	129,386	9 67/100
Culloden	Culloden	2310	75	...	173,246	9 8/10
Rose	Bridgenorth	216	55	16	11,862	.....
Otterville	Otterville	286	63	16½	18,072	10 1/8
Londesborough	Clinton	1100	62	15	68,226	10 26/100

Collin's	Mount Elgin	900	70	16	63,000	10
Mugan's	St. Thomas	886	71	16	63,027	10 18/100
,,	,,	634	70	16	44,380	10 2/10
Northport	Northport	2120	56	15	118,720	9½
West End	Clinton	960	55	15	52,800	10½
Wyoming	Wyoming	525	69	16	36,236	9⅔
Middleton and Bayam	Acacia	1933	60	15	115,991	10 1/10
Mapleton	Mapleton	1548	73	16½	112,566	9 9/10
Harrietsville	Harrietsville	3669	74	16	269,206	9 87/100
Gram's	Derwent	901	70	16	63,070	10 41/100
Springfield	Springfield	1700	75	16	128,195	9⅘
Rodgerville	Rodgerville	1865	68	16	126,784	10⅖
Rimph's	Tilsonburg	350	70	16	24,511	10
Junction	Welland	343	60	...	20,570	10½
Dereham Centre	Mount Elgin	761	73	16	55,750	9 9/10
Butler's	Selton	...	...	...	54,000	10
Adelaide	Keyser	1506	75	...	122,950	10
Deer	Seaforth	1337	...	...	80,222	10 36/100
Norwich	Newark	1900	72	16	135,418	10 1/9
Rougemont	Rougemont	547	67	...	36,647	9 74/100
Sheffield	Sheffield	912	69	16	62,928	10½
Oak Grove	New Hamburg	600	73	16	43,800	9⅓
Cromarty	Cromarty	630	58	16	36,517	10 29/100
Fullarton	,,	630	60	16	37,730	10
Frank's	Harrietsville	170	74	16	12,625	...
Maple Grove	Strathallan	1356	74	...	100,024	9 7/10
Sparta	Sparta	192	65	16	12,592	11
Garner's	Drummondville	360	60	16	21,060	10⅕
East Nissouri	Ingersoll	5323	65	15	346,000	10
Thomasburg	Thomasburg	2000	73	16	146,083	9 56/100

Name of Factory.	Post Office.	No. of Cheese made.	Average Weight.	No. of inches in diameter.	No. of lbs. of Cheese.	No. lbs. of Milk to lb. of Cheese.
Brucefield	Seaforth	1660	60	15	10,000	$10\frac{1}{2}$
Victoria	Kerwood	685	71	16	49,175	$10\frac{1}{10}$
Henderson's	Ingersoll	356	60	15	21,360	$9\frac{72}{100}$
Straith's	Clinton	354	55	15	19,339	$10\frac{65}{100}$
Harris Street	Ingersoll	3257	70	16	228,076	$10\frac{2}{10}$
Tyrconnell	Tyrconnell	1185	67	16	80,000	$10\frac{1}{4}$
Maple Leaf	Ingersoll	1175	67	16	79,396	$10\frac{18}{100}$
Ridgetown	Ridgetown	497	66	16	31,892	10
Burgessville	Burgessville	1398	69	...	96,976	$10\frac{18}{100}$
Pioneer	Norwich	1221	68	16	83,424	$10\frac{27}{100}$
Oxford	”	809	67	16	54,224	$10\frac{4}{10}$
Bayam and Malahide	Corinth	970	69	16	66,986	10
Thames	Nilestown	2140	75	16	160,000	10

ANNUAL ADDRESS

BEFORE THE

CANADIAN DAIRYMEN'S ASSOCIATION,

FEBRUARY 7, 1872,

BY

X. A. WILLARD, A.M.,

Of New York,

LECTURER IN CORNELL UNIVERSITY AND IN THE MAINE STATE AGRICULTURAL COLLEGE; AUTHOR OF PRACTICAL DAIRY HUSBANDRY; AND PRESIDENT NEW YORK STATE DAIRYMEN'S ASSOCIATION AND BOARD OF TRADE, &c.

THE PRODUCTION OF MILK, AND THE REQUISITES FOR MAKING GOOD BUTTER AND CHEESE.

MR. PRESIDENT, LADIES AND GENTLEMEN,—I esteem it extremely complimentary to be again called upon to address Canadian Dairymen in convention at this place.

I think I may truly say I have no strong sectional prejudices in regard to the branch of industry which this large convention represents.

I feel a deep interest in the progress of American dairying everywhere upon the continent, and there is no place where I have

had more desire to do good than in Canada; and I trust in whatever I may have to say I shall not lose your good opinion.

VALUE OF THE MILK CROP IN THE UNITED STATES.

The annual milk interest of the United States may be expressed by the following formula: 1,800 quarts of milk at 2⅓c. per quart=$42 by 10,000,000 cows=$420,000,000.

The 1,800 quarts represent the average annual yield of a cow during the year. If we put the milking season at 300 days, the average yield would be at the rate of six quarts per day. The 1,800 quarts would make about 360 pounds of cheese, or say 150 pounds of butter.

We have statistics showing pretty nearly the value of the milk crop of the United States, in items, as follow:

Milk consumed as food, at 2½c. per quart	$213,000,000
Condensed milk	1,000,000
Butter product, 700,000,000 lbs., at 25c	175,000,000
Cheese product, 240,000,000 lbs., at 12c per pound	28,800,000
Value of whey and sour milk from cheese and butter manufacture. Converted into pork and calves	10,000,000
	$427,800,000

A value very nearly that expressed in our formula.

Commissioner Wells, in his report on the commerce and industry of the United States in 1869, estimates the annual value of the products of the dairy, after deducting the value of products consumed on the farm, at $400,000,000. He believes that his estimates fall considerably within the mark, and in proof of this assumption he instances the dietary of factory boarding houses, where the operatives were in a large part French Canadians, notoriously frugal and simple in their habits, and in which they were furnished to their own satisfaction, which showed an average consumption of butter, amounting to about $16. 51 per year. An average consumption for the entire population taken at one-half this sum or $8, 25 per head would result in the expenditure on this account of $321,000,000.

A consumption of milk to the value of one cent per day for each person would give an additional sum of $143,350,000 making a total of these two item of $464,000,000.

Any one who is acquainted with the manner in which milk, and more especially butter, is consumed in the families of American labouring men as well as in the houses of the wealthy, and well to do classes will acknowledge that these estimates are low. These enormous values are to be disposed of annually, and it is a matter of interest to dairymen to know where they are placed. Nearly the whole bulk of our dairy products is consumed at home: for if we refer to official statistics we find that about 60,000,000 pounds of cheese, and about 7,000,000 pounds of low grade butter, much of it known under the name of *grease*, go abroad. The value of our entire surplus in dairy products may be put at the following figures :—

60,000,000 lbs cheese, 12c	$7,200,000
7,000,000 lbs butter, 25c	1,750,000
Condensed milk	500,000
Total	$9,450,000

An additional expenditure of 24 cents per year for each person, or two cents per month in any form of dairy product would wipe out our surplus and leave nothing to go abroad.

Our cheese product, the past year has been sold exceedingly low, and the best informed commercial men tell us that it is likely to be low in price for a series of years. It is a matter then of some account to devise means by which the dairyman may relieve himself from this very serious trouble which threatens him. It is believed by many that the cheese product of the United States at the present time is no more than is annually needed for home consumption, provided the consumption be distributed properly over the year. It is estimated that we have 30,000,000 of people who would consume cheese were it of unexceptional quality and conveniently supplied. Say that each consumed 8 pounds a year at a cost of fifteen cents per pound, or $1.20, and our whole product would be consumed. At this rate one cheese of sixty-

four pounds weight would supply a family of eight persons for the year. Eight pounds a year would be at the rate of about two and a half ounces a week—a small item, surely considering that men not unfrequently make way with a half pound or more at a meal. I am more and more convinced that it is upon home markets that we must rely in obtaining a fair compensation for our products. There are hundreds of villages in the United States where it is impossible to get a pound of good cheese from one end of the year to the other. We need to introduce among us the English system, where every village has its cheese store, and where customers can be supplied with variety of styles and qualities, small cheeses as well as large. People cannot be expected to buy cheese unless it can be conveniently had, and in such form and quality as will suit especial wants and tastes. The American system of depending upon a foreign market, and forcing forward immense stocks in hot weather is a vicious system and must always prove more or less disastrous. Let us reason upon this matter without any absurd theories or speculations. I shall appeal only to your common sense, for a practical solution of the question. I affirm the factory system of curing cheese and marketing in hot weather is grossly defective and is a shameful waste of the hard earnings of dairymen.

WHAT ARE THE FACTS ?

The great bulk of the factories in the United States and in Canada have no conveniences for curing cheese properly, and have no provision for accumulated stocks. The cheese-curing process is one requiring skill and attention to details second only to the manipulation of the milk. The fundamental principles in this department are almost entirely overlooked and ignored by the cheese-makers of this country. From the time the cheese goes from the press to the market, it is left to take its chances with the weather, and its quality, when produced from good milk, varies precisely as the weather happens to approximate to a certain uniform temperature. A temperature science verified by practical experience has demonstrated to be the true range of heat for pro-

ducing fine cheese. We now know that the whole art of cheese-making consists in the proper development of a peculiar species of fungi, and that the trouble in cheese making also arises from another class of fungi, more or less vicious in character, which gets possession of the milk, and curds, or the cheese upon the shelf, overmastering the first-named organisms, which are the cheese makers' real friends. Their action is altogether harmful, and according as they have been allowed to develop and take possession of the cheese is the product inferior, poor, bad or worthless. Now, the useful class of fungi must have a temperature favourable to their growth and development. The cheese-maker's art is to mould them to his will, to induce them to perform a specific office, to attack the casein or nitrogenous elements of the cheese and to break it down into a mellow, plastic state, without doing injury to flavour; in fine, to prepare it in the best form both as to healthfulness and taste for the human stomach. This, under certain conditions, it will do with mathematical precision and certainty. You know how plants and animals are moulded to do the bidding of human intelligence; how Bakewell produced his sheep; how Colling, and Bates, and Booth have made their Shorthorn? How the pomologist has changed the sour and bitter crab into the large and luscious apple.

You see how even inanimate nature has been made to do our bidding. How water in the steam engine has become the great propelling power of the world; how lightning chained to the telegraph has been made to talk. God has given us unbounded limits of power over animate and inanimate matter, providing we employ the immutable law that governs it.

So this minute microscopic fungi, under the hand of intelligence, will do our bidding in the cheese vat and upon the cheese shelves, if we understand and apply the law which the All-Wise Creator has laid down for the government of its being. Now to obtain the best results, the growth and development of the fungi, (or in other words the fermentation of the cheese) must be uniform and continuous. You cannot induce excessive activity one day, followed by a cessation or checking

of the process the next day, and so on, and obtain a high standard product.

CURING-HOUSES.

Cheese made from good milk and with only ordinary skill in manufacture, when placed upon the shelf in a well ventilated cheese-curing house, and kept in a uniform temperature of 70° to 75°, will almost invariably cure down fine in flavour and quality. The action of these fungi (call it fermentation if you choose) is peculiar and not yet fully understood. Certain it is, however, that they have the power of converting casein into fat, or a substance similar to fat, and hence by attention in curing, a cheese made from milk partially skimmed may have as mellow and meaty an appearance and taste as whole milk cheese cured in variable temperature. This is a fact abundantly proved by science and has been fully demonstrated by the analysis of Voelcker. This peculiarity in the manufacture, and curing of cheese was brought to my notice in 1866, during my examination of English dairies. Mr. Harding, the distinguished exponent of Cheddar cheese-making in England always insisted that the goodness and delicate flavour of the cheese depended as much upon the temperature and manner of curing, as upon any extra manipulation in making. He affirmed that by keeping the temperature of his curing room at 70° to 75°, without variation, he could remove a considerable portion of cream from the milk, and then be able to make a cheese that would sell in the London market for the highest price. It was his usual custom to take the cream from the night's milk, and I have never seen or tasted cheese more perfect in flavour, or with more of the characteristics of what we term "fine cheese," than that which I ate at his table. His curing room is surrounded with a nest of iron pipes, which are supplied with hot water from the boiler below, whenever the temperature of the curing room falls below 70°. In the low, even temperature of England, his curing room, built in with heavy walls of hollow brick, and with ample provision for ventilation, seldom varied in temperature from 70°. I have experimented sufficiently in my own dairy to

know that with good milk and with a good curing room kept at 70° to 75, there is no necessity for bad flavour, and that cheese can be kept from one year's end to the other and retain that mild rich nutty taste which the English so justly characterize as the best manufacture. I feel earnest about this matter of curing cheese, because I am convinced its neglect is the great fault of American factories. The complaint is quite common that American cheese will not keep. The secret of long keeping cheese is not so much in its manufacture as in the milk from which we make the cheese and in its curing. Our dairymen complain that prices are low and are seeking for a remedy. The remedy lies in better milk and in larger and in better curing-houses.

In New York there is not a single factory within my knowledge that can hold cheese over in hot weather, and retain its flavour. Even under our system of weekly sales immense quantities of July and August cheese are overheated and tainted in flavour when it leaves the factory. Then there is not one factory in a hundred that can hold more than six or eight weeks' make of cheese. You hear of immense shipments of cheese in hot weather and at low prices. Well, the factories are *forced* to sell. They say, "we dare not keep it, for it is beginning to turn in flavour, besides our rooms are full and it must be sold." Now is it any wonder that dealers buy low and that dairymen are placed at disadvantage? Why, my friends, you and I and everybody else will buy as cheaply as we can. Has it not become a proverb that "you cannot realize the full value on forced sales?" Now this is the condition of the American cheese market during a large part of the year and England knows it, and our own cheese dealers know it. But the dealers after purchasing are anxious to get rid of the goods quickly especially in hot weather. They have an article upon their hands which they know is constantly depreciating, and is liable to be lost altogether, and so they shift the responsibility as soon as may be, making what margin they can. It is just so in England. It is known that much of our cheese will not keep, and shippers are on nettles until they clear their warehouses of stocks as fast as they come in. It is this over anxiety, this hot haste to have our

product change hands for fear of loss that brings prices down. You will observe that English Cheddar holds its own at 76s to 80s the cwt., year after year. Why? Because it can be held a long time without depreciating.

Oh, my friends, I sometimes feel tired and discouraged in talking to people who have no eyes to see and no ears to hear. It takes such a long, long time for men to get out of the old and deeply worn rut. Life is so short, and it seems to be such a waste to be always plodding—plodding along in a palpable error.

HOW TO IMPROVE CURING-ROOMS.

But you will ask, in what way can curing-rooms be improved, and in what way can the buildings already erected be utilized? In the first place, whenever possible, I would have a cellar under the dry house; I would have it 6 or 8 feet below the surface, the walls rising above the ground two or three feet, or of a height sufficient to give an abundance of sunlight throughout the whole basement.

I would have this room 10 to 12 feet high in the clear, and the bottom should be thoroughly underdrained. Then the floor should be grouted and covered with cement or flagging, so that no leakage or accumulation of slops is possible. Ventilators with wickets should be arranged leading to the rooms above or to the roof. Such a basement would add very much to the capacity of the dry-house, and by attention to drainage and ventilation, may be kept at a low temperature during hot weather. It may be provided with hot water for heating if necessary, the pipes connecting with the boiler, so that heat may be supplied at any time with little expense. Here I would place a part at least of the cheese made in hot weather, and all such cheese as could not be readily marketed at a good price. Supposing every factory had a cool place for storing but 200 cheeses in hot weather the quantity in the aggregate would be very considerable. There are over a thousand factories in the state of New York alone; say that there are 1500 in all that can store 300 cheeses each, above present capacity; the gross amount would be 27,000,000 pounds. This amount kept from the markets in hot weather—safely kept with

no fear of deterioration but retaining its flavour, and growing better in quality—would so relieve the trade that good prices would probably result on that shipped. I would not advise the keeping of cheese at any time when fair living prices can be obtained for it. Then I would adopt the Crosier plan of leading the cold air from the ice-house. In this plan two conductors go down from the upper part of the ice-house. They are made of boards eight inches wide and an inch thick with holes bored in them. The holes allow the cold air to enter from the ice, and it pours in a stream from the mouth of the tube into the room. The temperature of the air as it comes out at the mouth of the tubes is about 35°. With thick walls and with high windows, he is able to lower the mercury to 62°, and even lower in the hottest July weather.

Sometimes he closes one tube to keep the room from growing too cold. The draft is strongest in the hottest weather. By this arrangement, and the hot water pipes, the desired temperature may be secured the season through. I do not pretend to give the best plan for securing an uniform temperature; I give that which is comparatively inexpensive, and which has been found to be practicable, to show you that such an arrangement is within the reach of every factory; and that this matter of controlling temperatures is not so difficult as dairymen have been led to imagine. By this simple arrangement, probably, the room immediately over the basement, (if outer walls were properly constructed) could also be made cool enough in hot weather. I would have every factory have a store room sufficient to hold all the hot weather cheese, so that at no time to be forced to sell on account of room.

Now I have tried to show you some of the advantages that would result in curing cheese properly and in having sufficient store room to hold a certain amount of hot weather cheese during hot weather. Let me illustrate how this course would be likely to effect the market. In the first place the quality and flavour would be improved. In the second place by withholding a portion of your stock, and not crowding the market at a time when the hot weather makes it a fearful risk for dealers to handle

large quantities, you will be able to maintain a price for what you do sell. This is a natural consequence and is one of the laws of trade. By pushing your whole product forward, the risk, and the glut in the market, forces prices down as it has the past year to 11 and 12 cents. But suppose you hold back a third of your make, selling two-thirds at increased rates, or for what it is worth, say 16c. Take 300 pounds of cheese for instance as an illustration. The 300 pounds at 11c would be $33.00. That represents the present system. But if you keep back 100 pounds, selling the 200 pounds at 16 cents, you have $32,00, or within one dollar of the receipts first named, and the 100 pounds remaining back. In other words, the 100 pounds remaining in your curing-room if sold at one cent per pound, would bring you out even with sales made according to the first system. This is the English plan. They do not force forward their goods in hot weather when they *must* be sold at a sacrifice on account of depreciation and decay from heat; but they sell only so much as will go freely into consumption at a good price.

GOOD MILK.

I have said that one great fault in American cheese-making to-day is in the curing of the cheese. I have said that with proper attention to curing, and with only ordinary skill in manipulating *good milk*, a first-class product can be made, and I reiterate the affirmation, but I wish to call attention to that part of the affirmation expressed in the two words "*good milk*." We have a great deal of talk in New York about "fancy cheese," and high skill in cheese-making. Some factories have a great name in this respect, and the cheese-makers who manage these have an exceedingly high reputation. They command high salaries and are eagerly sought after. Cheese-makers from a distance frequently come to visit these noted factories to learn the art of making "a fancy product," and they do learn it, but when they go back to their own factory and commence practising upon their learning, they not unfrequently fail to make any better product than before. Again, sometimes a fancy factory, with its skilled manager

suddenly falls into the back ground. Dealers say "he is off the track," and patrons complain that the cheese-maker is getting careless and negligent. Ah! my friends, this cheese-making business is a serious thing at times, I can assure you, and especially so when one "gets off the track" without knowing where the trouble lies, and lays awake at night and does all in his power to get back again. And then to hear disparaging remarks, and the grumbling of patrons about being beaten in sales by a neighbouring factory. I have seen such things a great many times and I have felt a sympathy for these men in their troubles, because I have known that often they are not to blame. No. When an experienced cheese-maker is attentive to his business, and "gets off the track," his trouble generally comes from imperfect milk, unsuspected at the time of its delivery at the factory. I do not mean imperfect milk resulting from want of cleanliness and the general care of milk after it is drawn from the cow; that matter has been discussed from time to time at our dairy conventions, and farmers ought to be pretty well informed upon the evils coming from such filthy practices. Dairymen, it is true, are not generally up to the mark in this respect, for there are vast quantities of cheese every year injured on this account. But you will understand that among the "gilt edged factories," this matter of cleanliness is becoming more and more rigidly enforced among patrons. Now, the question upon which I desire to call your attention, is concerning those causes of bad milk lying back of these common and flagrant ones. The dairyman may be one of those fastidiously neat men, who takes pride in having everything neat and clean about the dairy buildings in respect to his milk. Now it is difficult to convince such a man that he is delivering bad milk; and the cheese-maker at the time of receiving it at the factory may not even be able to detect, or even have cause to suspect its being bad, but nevertheless it *is* bad, and becomes the means of getting the cheese-maker off the track.

Perhaps the most prolific cause of bad milk in such instances, results from the cows drinking the water of stagnant pools, tramping through swails of mud which are alive with filthy organisms of

decomposing vegetable or animal matter. I need only to refer you to some facts coming under my own observation, and the result of scientific investigation by Professor Law, of Cornell University, to show you how milk may be spoiled while the dairyman suspects nothing wrong.

INHALING BAD ODOURS.

Experience and scientific investigation have established the fact that milk is spoiled in the cows bag, simply on account of the cows inhaling bad odours while at pasture. We have numerous instances where deaconed calves thrown out and left exposed in a portion of the pasture—where dead horses, and the carcasses of other animals have been allowed to putrify in such places that the cows inhaling the stench from these decaying remains of animal matter, the milk has taken a putrid taint before being drawn from the bag. This taint may not be perceptible the moment it is drawn any more than the physician can detect small-pox in a person who has recently been exposed to that disease, but the seeds or germs of putrefaction may be there nevertheless, and, in the case of the milk, begin to show themselves, and to give trouble to the cheese-maker, before his curds are ready for the press. Or if he succeeds in getting the curds in press without much difficulty, the cheese not unfrequently shows an early taint, decays quickly, and turns out bad. The troubles from this source are much more frequent and produce more extensive evils than are commonly supposed.

MILK TAINTED BY DUST AND BY BAD WATER.

I have seen numerous cases where the milk has received a taint from particles of dust falling from the cows into the pail while milking, and unsuspected of doing harm by the milker. Cows that are allowed to pass through sloughs of mud, places filled with decomposing animal and vegetable matter, get their udders and bodies more or less bespattered with this filth. At the time of milking this dirt has become dry, and the more bulky portions may have fallen off, but enough remains to form a dust which, in

the process of milking enters the milk and thus the seeds of a filthy decomposition are sown. You may not be able to detect anything bad in such milk for an hour or so after milking, or when it arrives at the factory, but it is nevertheless bad and will cause trouble, either while the milk and curds are being manipulated, or in the flavour of the cheese upon the shelf. Farmers generally have not understood or appreciated these things. They have been looking wholly to the art of the manufacturer for securing a good product, assuming so long as milk can be got to the factory before it sours, or before it becomes rotten or stinks, all responsibility is shifted upon other shoulders than their own.

And in this connection, I must refer you to two notable cases illustrating the point in question. In the summer of 1870, while on a visit to Mr. L. B. Arnold, of Tompkins County, New York, I saw an instance of dust innoculating milk brought to the factory. When the milk was received at the factory window, there was no reason to suspect taint from any particular dairy. The delivery from the several patrons went into the vat together, and was set in the usual manner with rennet. But during the process of heating up the curds a most intensely foul and disagreeable odour was emitted. The cheese maker sent for Mr. Arnold and myself, and we went down to the factory together. We found the curds then about half scalded, giving off a stench exceedingly offensive—a smell like that coming from a nasty mud hole stirred up and exposed to the air in hot weather. There was no mistaking the peculiar odour, and I suggested at once that some of the patrons were allowing their cows to slake their thirst from stagnant pools. He afterward traced the milk to its source and found the trouble to come from one patron, who, after turning his cows to the after-feed, had allowed them to cross a narrow slough where particles of mud adhering to the udder and hair, and becoming dry, the dust entered the milk during the milking, and had introduced a class of fungi which by their multiplication spoiled the milk, The patron had meant no harm. He had taken every precaution so far as his knowledge extended for the delivery of good milk, and on correcting the fault the trouble ceased. Another case is in point, and

which occurred the past summer, 1871. Professor Law, of Cornell University gets his supply of milk from a milk-man. One day during the hot weather he observed a peculiarity in the cream rising on the milk furnished by the milk-man. It appeared to be ropy, and on subjecting it to an examination under a powerful microscope, it was found to contain a large number of living organisms in different stages of growth. Pushing his investigation further, the Professor called upon the milk-man to inquire concerning the management and keep of his cows, and the manner in which the milk was cared for. Here he found, on looking over the premises, that the cows for lack of good clean water—the season being unusually dry—were forced to slake their thirst in a stagnant pool located in a muddy swale. Taking specimens of this water and examining it under the microscope, the same class of organisms was found as those in the milk. It was now pretty evident where the cause of the trouble lay; but to make the matter more clear, specimens of blood were taken from the cows, and examined under the microscope, when these also were found to contain the same class of organisms.

The animals, on applying thermometer tests for determining health and disease, were found to be hot and feverish, thus showing that these living organisms introduced through the medium of the filthy water and taken into the circulation, and by their power of reproduction and multiplication in the blood, became the source of disease. Investigating still further, a particle of the filthy water was introduced into milk free from such organisms, and known from tests to be in good order, and in a short time the same filthy organisms multiplied and took possession of it in vast numbers, producing the same character of milk as that first noticed. Other experiments and investigations were made, but all similar in result to those I have described. These facts are of very great importance to dairymen, and although it was known that the milk from cows drinking the putrid and foul water of sloughs and mud-holes had caused much trouble at cheese factories, still dairymen hardly appreciated the full extent of the trouble or were aware of the precise nature of the injury caused

by such water. If the lives of those foul organisms are not destroyed when taken up by cows in their drink, but pass into the circulation, tainting the blood, entering the secretions and establishing their filthy abode in the milk, there to increase and multiply in vast numbers, causing the milk to be a mass of filth; then it is reasonable to suppose that persons partaking of this milk, even when freshly drawn, are liable to have their blood also inoculated and thereby contract disease. Who can say that malignant fevers and fatal epidemics do not often originate from these sources? The facts brought out in these investigations would seem to warrant the supposition. At any rate they are sufficiently startling, and should arrest the attention of those who have the care of milk stock, and who are in the habit of using milk freely. They prove that clean water is at least a prerequisite for the cow to yield good, healthy milk, and that there is more danger in allowing stock to slake thirst in foul, stagnant pools, than has commonly been supposed.

In my report upon English Dairies in 1866, made to the American Dairymen's Association, I called attention to the character of English milk as cleaner than ours, and I attributed the finer flavoured cheese of England, in a great measure, to this one cause Nothing struck me with more force than the care taken by the Cheddar dairymen of Somersetshire to get good milk. The pastures are well drained and provided with an abundance of clear, running water. There are no filthy pools or mud-holes where cows are allowed to tramp and wallow in search of water. The milking sheds are open on one side, paved with stone and cement. There is sufficient incline back of the cows, so that all filth flows into the stone gutters, and after milking, all the droppings are removed and the floors and gutters are flushed with water, so that everything is clean and sweet for the next milking. The liquid, excrements and washings are conducted into a tank sunk into the ground, outside the milk-house, and from thence as occasion requires are applied to growing crops. You will see that under this system of clean pastures, clean stables, and clean dairy-houses, a better milk is obtained than with us, and thus with proper atten-

tion to curing cheese on the shelf, the Englishman, with less skill than ourselves in cheese manufacture, is enabled to make a superior product. I am convinced that unless the dairymen of America commence at once to pay attention to cleanliness in pastures, not only in regard to slough-holes, but the eradication of weeds, providing stock with an abundance of fresh, clean water, together with attention to curing cheese, European manufacturers will soon outstrip us in the race "for making fine goods." The factory system is now being established in Europe. All our inventions and appliances are eagerly sought after and every good thing discovered by us adopted. England, Sweden, Germany, Russia, Holland and Switzerland are adopting our factory system. Under monarchial governments and hereditary land-tenures like those of Europe, the farmer is compelled by his landlord to farm in certain directions, and the result is a systematic regular course of husbandry by which better results are obtained than with us, where every farmer does his work in a hap-hazard way without any regard to science, or a rational system of culture. Dead carcasses exposed to the air to putrefy, cess-pools reeking with filth, stagnant water filled with decomposing vegetable matters are regarded as public nuisances, and those permitting them on their premises are liable to criminal prosecution.

Now in regard to milk, we are no longer left to grope along blindly in the dark. Hallier, Pasteur, and a host of other distinguished investigators have, with the aid of the microscope, demonstrated how milk is changed from its normal condition by fungi—how these minute organisms emanating from filthy matter get possession of the milk, and convert it into a state similar to that substance from which they emanate; and it is from this standpoint, established as a truth by scientists, that American dairymen must base their operations. The trouble heretofore has been that we had no sufficiently established starting point. We were experimenting with the *effect*, without understanding definitely the nature of the *cause*.

But now, clearly understanding the cause *and* its effects, we can apply the remedy. I have no doubt the terrible disease known

under the name of "milk-sickness," so prevalent in Indiana and other parts of the West in hot weather, will be traced to certain species of fungi in the milk, derived from bad water or some vegetable decomposition. These enter the circulation of the animal and poison the milk, and it is not the result of any poisonous plant the cows eat.

WHAT IS TO BE DONE?

What then, you will ask, shall we do to relieve ourselves from these difficulties? I would urge (and oh! my friends, I wish I had language and persuasive power sufficient to have you feel with me the deep necessity of attention to this matter,) I would urge that every factory and dairy association call its patrons and members together before the commencement of cheese-making. Let the necessity of producing healthy milk be clearly stated and discussed, then let a manager be appointed to keep a daily record as to the condition of all milk delivered. Clothe him with authority to examine the farms where the milk is produced, agree upon a set of rules that shall impose a fine, or a lower percentage of product upon the patron delivering milk from over-driven, over-heated cows, and from cows kept in pastures where the abuses to which I have referred are permitted. Let the manager reject all milk that he knows to be imperfect. Adopt Mr. Gail Borden's plan of testing milk by samples, in which standard of lactometer, temperature, cream, feed of cows, condition of milk as to souring and flavour are all noted from day to day, and the average summed up at the close of the week. In this way you soon discover from what source the bad milk comes. In this way you make progress and your product will take the lead in the markets of the world.

My friends, this work of education must begin, sooner or later; the longer you put it off, the more money you throw away in a useless, wanton waste. I have some experience in farming, and I know that he who works with his hands cannot afford to lose the fruit of his labour in this miserable way. Providence imposes a curse upon those who knowingly make a wilful waste, and the poisoning of milk is not only wilful, but wicked. I do not say

but that many, perhaps all of you, within reach of my voice, may have of your abundance to spare, but if you have, let it go to those unfortunate creatures starving in garrets, suffering from cruel disease. The poor everywhere claim our charity. God honours them that give, but this wanton waste helps nobody, but on the other hand is a positive evil, since one man's bad milk injures all the good milk with which it comes in contact.

ELECTRICAL INFLUENCE—CAUSE OF MILK SOURING IN THUNDER STORMS.

The fungi theory serves to explain many things concerning milk heretofore shrouded in mystery. Take for instance the well known fact that milk rapidly turns sour during or after a thunder storm. A good many reasons have been assigned as the cause, but I have seen none giving so satisfactory an explanation as that resulting from the experiments of Andrew Cross. It is now forty-six years since the British Association and the world at large were startled by a statement that a man unknown to public fame had not only succeeded in producing known combinations of existing substances by means of electricity, but some combinations novel even to chemists. Shortly afterwards, it was announced that the same person had produced an unknown species of insect life by electrical experiments, or at all events insect life had been produced in positions that would have been destructive to life or the germs of life if placed there accidentally. This man, then, unknown to fame, was Andrew Cross, a native of Somersetshire, England, whose death occurred in 1855 at the age of seventy-one. He had in the course of his life filled his house with electrical apparatus, and even extended it to the trees of his park. Here he experimented year after year, simulating in his laboratory some of the hitherto most mysterious of the processes of nature. He pursued this line of research for more than thirty years, totally unknown to the world, when in 1837 he was in a manner discovered by the British Association. Being induced to attend the meeting of that body at Bristol, he and his researches became known to Dr. Buckland, who took an opportunity of speaking of them, and introducing Mr.

Cross as a man unconnected with any scientific body, who had actually made no less than twenty-four minerals and even crystaline quartz. The audience regarded him with astonishment, and their feelings were wrought up to a high pitch when they heard himself relate his experiments and their results. He owned to having made crystals of quartz and arragonite, carbonate of lime, lead, and copper, sulphurets of lead, iron, copper, silver, and antimony, besides more than one hundred other artificial minerals. He considered it possible to make even the diamond, and expressed his belief that every kind of mineral could yet be formed by the ingenuity of man.

The crystal producing operations were the subject of nearly unmixed admiration, and for some months Mr. Cross stood on the pinnacle of fame as a great and original discoverer in science. People spoke of his making crystals, without either seeing that he in reality only arranged the conditions under which nature did the work, or imagining that such creative effort as they attributed to him involved any impiety. It was by and by announced, and unauthoritatively, that while Mr. Cross was experimenting with some highly caustic solutions out of contact with atmospheric air, there had appeared, as if gradually growing from specks, between the poles of the voltaic circuit, certain insects of the *acarus* tribe. The truth was this: Mr. Cross had contrived a little apparatus for the deposition of crystals of silica in a lump of stone, through the agency of a voltaic trough. After the lapse of a fortnight he observed a few small, whitish specks on the surface of the electrified stone. On the eighteenth day these specks had expanded, and from the surface of each seven or eight filaments were thrown out, but without exciting any surprise on the part of the observer, for embryo minerals exhibited similar phases in their passage to the crystallized state. Soon, however, the swelling specks assumed the aspect of insects standing erect on the bristles which formed their tails, and on the 28th day Mr. Cross distinctly saw them move their legs. Imagine the surprise of an experimenter who had come looking for a simple mineral but had found—life! There could be no mistake about the matter. The creatures were no mocking in-

sect apparitions—for in a few days they detached themselves from the stone, and began to roam about like other independent animals. Loathsome things they certainly were, for they belonged apparently to the genus *acarus*, which is famous for its ugliness, and which numbers some of the most nauseous parasites in creation in its ranks. But they continued to increase, and in the course of not many weeks at least a hundred were charmed into life. "How?" was the question. To this Mr. Cross attempted to give no decisive answer. "I have never ventured an opinion," said he, many years afterward, "on the cause of their birth, and for very good reason, I am unable to form one. The simplest solution of the problem which occurred to me was that they were from ova deposited by insects floating in the atmosphere and hatched by electric action. Still I could not imagine that an ovum could shoot out filaments, could become bristles, and moreover I could not detect on the closest examination remains of a shell. Again, we have no right to assume that electric action is necessary to vitality, until such fact shall have been distinctly proved. I next imagined that they might have originated from the water, and consequently made a close examination of numbers of vessels filled with the same fluid; in none of these could I perceive the trace of an insect, nor could I see any in any other part of the room."

The experiments were repeated in various ways, and with numerous precautions to prevent the introduction of extraneous matter. Still the insects appeared under circumstances which seemed to be totally adverse to the manifestations of animal life. They grew up beneath the surface of liquids in which they could not afterward exist. They did so in fluids which were caustic or absolutely poisonous. They were extracted apparently from materials which had been fused in a heat exceeding that of melted iron and from solutions poured while boiling into the apparatus. They were engendered under an atmosphere impregnated with chlorine or charged with muriatic gas. Similar experiments, too, were afterward undertaken by Mr. Waker, of Sandwich, who was still more solicitous, if possible, to exclude all foreign elements of

vitality, but the acari laughed at his pains, and after a lapse of twelve or eighteen months invariably presented their unhandsome forms for his inspection. What could be said? It seemed obvious that electricity exercised some peculiar influence in the development of these uncouth little creatures. But in what way, and to what extent? There were persons who did not scruple to conclude that the insects were really originated by voltaic power, and that this marvellous agent could under certain circumstances inspire dead matter with the principle of life, and mould it into living, breathing forms. Philosophers and men of science were puzzled by the intelligence, which flew over Europe like wild-fire. But the bigots—the men of starched souls—they whose judgments were strangled by a thousand prejudices, and who looked at all science through the smoked glass of their own conceit, were furious at the father of electrical acari.

Mr. Cross was arraigned as if it were wicked to send a voltaic current through a silicious fluid. He dealt with unhallowed apparatus and was always trying profane experiments. He must be an atheist. He was an atheist. He pretended to create insects. Such a man ought to be suppressed. Who knew but if he professed to make mites he might also attempt to produce butterflies, sparrows, cats, spaniels—animals of all descriptions—by the same unlawful means?

Nay, should we not hear some day of hopes being entertained that little boys would ultimately appear at the positive, and little girls at the negative poles of his diabolical batteries? One worthy individual took the trouble to write to the impious philosopher, denouncing him as a "disturber of the peace of families" and a "reviler of our holy religion."

"I have met with so much virulence and abuse, so much calumny and misrepresentation in consequence of these experiments," remarked Mr. Cross, "that it seems in this nineteenth century as if it were a crime to have made them." And painful as it is to think that, in such an enlightened age as ours, it should be necessary for a scientific explorer to parry the strokes of such vulgar spirits, it is nevertheless true that this excellent man had to de-

clare, for the satisfaction of the public, that he was neither an "Atheist nor a materialist, nor a self-imagined creator, but a humble and lowly reverencer of that Great Being of whose laws his accusers seemed to have lost sight." After all there was no real foundation for this abuse. That the ova of the insects were derived from the atmosphere, or conveyed into the apparatus by some natural means, (whatever fostering influences the electric fluid might be supposed to exert) was a point which Mr. Cross did not positively dispute. He did not know how to reconcile that view with the precautions he had used, but the idea of an electrical creation was one which such a man could never have entertained. It is enough, however, to say that the more recent experiments of Professor Schulze and other scientists have shown that when more stringent measures are taken to prevent the introduction of animal germs, the *Acari* of Cross are not produced.

NEGATIVE ELECTRICITY FAVOURABLE TO THE GROWTH OF FUNGI.

He invariably found that negative electricity was injurious to all vegetation except the development of fungi. When the electrical equilibrium is disturbed, and there is an absence of positive electricity, a wonderful development and growth of fungi takes place. Positive electricity, on the other hand, he found most favourable to all vegetation, except all fungoid appearances, which it checked. In the course of his experiments he constantly found fungi growing in copper and acid solutions. Mr. Cross considered that the roots and leaves of plants were in opposite states of electricity; some of his experiments in this direction are very interesting. He cut two branches from a rose tree. They were as nearly alike as possible, with the same number of buds, and both equally blown. An arrangement was made by which a negative current of electricity was passed through one, a positive current through the other. In a few hours the negative rose drooped and died, but the positive continued its freshness for nearly a fortnight; the rose itself became full blown and the buds expanded, and survived an unusual length of time. Again, he was able to keep milk

sweet for three weeks in the hottest weather of summer, by the application of a current of positive electricity.

On one occasion he kept fishes under the electric action for three months, and at the end of that time they were sent to a friend, whose domestic knew nothing of the experiment. Before the cook dressed them her master asked her whether she thought they were fresh, as he had some doubts. She replied that she was sure they were fresh, indeed she said she would swear they were alive yesterday. When served at table they appeared like ordinary fish, but when the family attempted to eat them they were found to be perfectly tasteless; the electrical action had taken away all the essential oil, leaving the fish unfit for food. However, the process is exceedingly useful for keeping fish, meats, &c., fresh and good for ten days or a fortnight. Now, this is consistent with our observation and the facts known to every one in the habit of handling milk. When the condition of the atmosphere is in a negative electrical state, or shows a deficiency of positive electricity, a state of weather which we designate as sultry, close, muggy and the like, there is always difficulty in keeping milk sound. Even in good healthy milk, the fungus germs common to all milk increase and multiply with great rapidity, producing the common lactic acid fermentation or souring of the fluid; but in case fungi from decomposing animal or vegetable matter come in contact with the milk, rapid decomposition takes place, and we have rotten milk, putrid odours, and floating curds. The exposing of such curds to the atmosphere, as well as the aeration of milk to improve its condition, are both philosophical, because these minute organisms of fungi are affected by the oxygen of the air, which checks their development and multiplication.

A NEW QUESTION.

The influence of electrical action is a question entirely new to the dairy public, but it is one concerning which I think some useful suggestions present themselves for our consideration. When the electrical equilibrium is disturbed, or when the state of the atmosphere indicates a preponderance of negative electricity, we

are all made aware of the fact, by its depressing influences. At such times it is important that we take more than ordinary care in the handling of milk; that it be kept out of harmful odours; that attention be given to its aeration, and such treatment be given it as shall be inimical to the growth and development of fungi. And again, the fact that milk may be kept sweet a long time in hot weather by electrical action will offer a very important suggestion to inventors in the preservation of milk, and perhaps in the improvement of cheese at the factories. I believe that we are only on the threshold of the cheese-making art, and that as we become better acquainted with the laws of nature and their application, great progress is yet to be made in every branch of dairy husbandry.

WHAT IS BEING DONE.

I have dwelt upon this matter of milk and the curing of cheese, because they are the living, vital questions of the dairy. Dairymen everywhere upon this continent have reason to be alarmed at the introduction of the factory system in Europe, with its cheap labour and immense fields of good dairy lands, for the day *may* come when *their* goods may be placed in competition with ours in our own markets. I tell you plainly that the dairymen of America are not making that rapid progress and improvement in their art which they should or that many imagine. We have developed a system of dairying and have a corps of skilled manufacturers here, and in every district upon the continent where the factories have been pushed, that have astonished the world. I look with admiration upon this great body of skilled workmen—men of large understanding—men of thought, whose intellects have been sharpened in devising ways and means to escape the difficulties constantly pressing upon them in their special calling—men who are eager to learn, and who are ready and eager to adopt improvements—men who assemble at these conventions, and who, by their united actions and energy are capable of lifting this branch of industry into the highest range of excellence. And yet they are obliged to lift and struggle and expend their energies upon a

dead weight—the dead weight of farmers who will not think—farmers who will not act—who hang back and settle themselves down in the old rut—farmers who do not believe in progress—who do not come to these conventions—farmers who whine at low prices—who dump their rotten milk at the factory doors and grumble because it is not made into "gilt edged cheese." It is this dead weight, this living corpse, that is to-day paralyzing our efforts for progress and improvement. I see these men everywhere in my travels—they have rhinoceros hides—they are wrapped up in their own conceit and will not believe—they have no eyes to see and their ears are too long to hear. Oh, my friends! it is this class which the progressive dairymen of the age are obliged to lift and carry along by main strength. If we could only reach these men; if we could only induce farmers to improve, to make that progress which the age and the cheese-making art now demands, our progress would be almost boundless, and the prosperity of the dairy interest would be beyond peradventure. When you take in consideration the immense quantities of putrid cheese and the vast product of rancid butter which you force people to eat, it is a wonder that we have so little surplus in the market from year to year. We talk about the difficulty of finding markets and of getting remunerative prices, and well we may for the kind of product we force upon the attention of consumers. Our best cheese goes abroad. The refuse is consumed at home. We complain because people will not buy and eat freely an article which is so poor and ill-flavoured, there is no pleasure in eating it.

WHAT A GOOD ARTICLE IS WORTH.

There is a market in New York and Philadelphia and other cities for butter at $1.00 per pound. Mr Lyman of the *New York Tribune* asserts that there are 5000 families in New York City to whom 75 cents per pound would not be considered a high price for all the butter needed for their consumption, if the quality desired could be obtained. Colonel George E. Waring states that he recently contracted for his butter with a Boston dealer (a man

who is handling tons of best butter at thirty to thirty-five cents per pound) at seventy-five cents per pound with promise of an advance by and by. Why it is that this butter commands at wholesale twice the retail price of "best butter," he explained in the "Ogden Farm Papers" as follows:—Simply because it is of extra good quality, hard, firm, high-coloured, well flavoured and well worked. It is put up in neatly ornamented half-pound cakes, each of them is wrapped in a square of damp muslin, and they are packed on shelves in an ice-box, so that they reach the market in the most attractive form. No pains are spared to make everything as appetizing as possible, and the butter really costs as much as five cents a pound more than it would if put up in the ordinary way. He says: "There need be no no fear of overstocking the market with really 'gilt-edged' butter. It will always be scarce and high. For instance, Mr. Sargent, of Brookline, at whose feet I sit in dairy matters, sells his whole product to Hovey—my customer—for $1.15 per pound, and Hovey sells it at $1.25. I hope in time to equal him."

IMPORTS AND EXPORTS.

The imports of dairy produce into Great Britain for 11 months ending Nov. 30, 1871, were, according to official returns as follow:—

	Pounds.	Value.
Cheese	129,329,600	$15,702,010
Butter	138,246,416	$32,098,210
		$47,800,220
In 1870, same time.		
Cheese	98,922,656	$13,767,165
Butter	113,552,992	$27,485,265
		$41,252,430
In 1869.		
Cheese	95,090,112	$13,397,115
Butter	120,987,440	$29,670,330
		$43,067,445

The importations for the other month, December, would doubt-

less, add to the above for each year from 15 to 20 millions of pounds of both butter and cheese.

According to the official returns from the Custom House, the exports from New York, from January 1st to December 23, 1871, were:—Cheese, 67,530,000 pounds; butter, 8,519,700 pounds.

In 1870, for same time:—Cheese, 61,457,500 pounds; butter, 1,394,200 pounds. An increased export of cheese in 1871 of 6,078,500 over 1870, and of butter the increase was 7,125,500 pounds.

On the 1st of January, 1872, Normandy butter sold in London at wholesale for 160s. sterling the hundred weight, and the Canadian at 70s. to 116s., a difference of over a shilling per pound gold on articles, both of which are imported into England.

My friends! we must study the palates of consumers if we wish to obtain fair prices. It is the quality of the goods that must coax consumers to eat and to pay, and not the empty words of those engaged in this interest.

CONCLUSION.

In conclusion I feel constrained to allude to a branch of dairying concerning which hitherto very little has been known by the dairy public. I refer to condensed milk, the profits upon which are enormous, a business now in its infancy, but which in my opinion is destined to have a very important bearing upon the dairy.

Statistics show that nearly half of the milk produced in the United States is consumed directly as food. We have between ten and eleven millions of milch cows. Thus five million cows are required for supplying fresh milk for consumption. If we add the milk supplied by the cow with an iron tail, the water dilution, it is estimated, would be fully equal in quantity to the product of a million cows more. Now, the condensing process is simply eliminating 75 per cent. of water from pure milk, and putting before consumers a reliable article of long-keeping qualities, purer and more wholesome than milk as usually sold, because the process of condensing kills those organisms which are often the cause

of disease in impure fresh milk. To give you some idea of the profits realized from this business, I will merely mention that a pound of preserved condensed milk sells for 29 cents.

The cost of the cured milk at three cents per quart and preparing it for market, is as follows:—

	Cents.
1½ quarts of milk at 3 cents per quart	4½
6⅓ ounces best refined sugar	4½
Condensing	1½
Can	3
Canning, &c.	½
Total	13

Leaving balance as clear profit after paying all expenses of 16c. on three pints of milk. A cow yielding on an average twelve quarts per day would at this rate yield a daily profit, after allowing three cents per quart for her milk, of $1.28. At the condensing factories the milk is bought of farmers at from three to five cents per quart, and the profits I estimate are about a dollar a day on each cow after paying farmers the prices I have named for the milk. There is an export demand for condensed milk, and it goes largely into use for ship stores. I was told at the meeting of the American Dairymen's Association that the condensed factories of Massachusetts and New York had recently received an order for eleven million pounds from China.

AN ADDRESS

DELIVERED BEFORE THE CANADIAN DAIRYMEN'S ASSOCIATION, AT INGERSOLL, ONTARIO, ON

THURSDAY, FEBRUARY 8TH, 1872,

BY

L. B. ARNOLD, Esq.,

Of Ithaca, N. Y.

MR. PRESIDENT, LADIES AND GENTLEMEN:—I am glad to meet you here to-day. I have long desired to make the acquaintance of Canadian Dairymen. I have watched with an anxious eye the development of the dairying interest, and have marked its career all the way as it has reached out from under the fostering care of its distinguished progenitor till its exports have reached some 15,000,000 of lbs annually, and I have felt anxious to become acquainted with the progressive spirits that have pushed the cause along so energetically. It would have given me pleasure to have come here in the summer when I could see your factories and your farms; but I am glad to meet you here to-day in Convention where I can see your people together and listen to the animated and interesting discussions of this large and intelligent audience, and to garner up for future use the valuable suggestions that are always developed by the contact of minds. And I am glad to be here to feel the friendly spirit and to place myself *en rapport* with the friendly sympathy between Dairymen on either side of the line; and I would be glad if in return for all this gratification I could

offer you anything that would be worthy of your consideration and thus to contribute my share toward a mutual entertainment.

POISON CHEESE.

With the great expansion of the cheese interest in the United States and Canada, there has been a steady improvement in the quality produced, but there have also sprung up some other results not so desirable; among them is the occasional development of poison cheese, concerning which I have been invited to speak to-day.

The first case of poison cheese that I can recollect, which attracted the attention of the public or the notice of the press, occurred some fifteen or sixteen years ago. It appeared first in Philadelphia, and afterwards in New York City, and I believe, some other places. The symptoms produced were very distressful, and indicated mineral poison, which it finally proved to be. It was easily distinguished from cheese not poison, by its containing black spots, which were traced to the white lead with which the cheese tubs and milk pails of the dairy were painted. The painting scaled and rubbed off into the milk or whey, and mingled with the curd, and by the agency of the lactic acid, developed in the curing of the cheese, was converted into lactate of lead. The cause becoming known, it was at once removed by painting dairy utensils with zinc instead of lead. Since that time cases of poison cheese have occasionally made a wave of excitement in the public mind. Lately, since the introduction of the factory system, they have become more frequent. That they should now and then occur is not strange. Cheese, in its best state, is poisonous to some people. Persons to whom cheese is so distasteful and poisonous that they cannot eat it all, are often met with. I once knew a case of most distressful vomiting from a child's eating a bowl of bread and milk, in which had been accidentally dropped a piece of cheese about the size of a pea. The cheese was not eaten. The vomiting was produced from the influence of the cheese imparted to the milk, as, upon examination, it was found in the bottom of the bowl. This poisonous action of cheese was not confined to this single in-

stance. It had manifested itself before, and continued the same from childhood to middle age, when the patient was lost trace of.

I have heard of other cases about as striking as the one described. It was not the fault of the cheese, in the case related, that it became so obnoxious. Other members of the household ate of the same cheese with no unusual effect. One of the most singular facts in this case was, that while cheese was so offensive in taste, and poison in effect, milk, and even curd, were eaten with a good relish and with perfect impunity. As long as the curd remained such it was agreeable and harmless; but the moment it became cheese it was distasteful and poisonous. It was therefore nothing in the milk, nor anything in the rennet that converted the milk into curd, that produced the peculiar result, It was evidently due to the cheesy fermentation in connection with a constitutional peculiarity of the individual.

But the cases of poison cheese that are occurring now-a-days are not just like the one described, for they occur with people who have been in the habit of eating cheese without any bad effect. Cases of this kind are not peculiar to the present day; they have occurred at intervals for fifty years or more, both in this country and Europe. But they seem to be of more frequent occurrence recently than at any time before. They are peculiar in their nature, and have undoubtedly one common cause. They are all alike in having no connection with any mineral poison. The most rigid analyses by different chemists have invariably failed to find in them any evidence or trace whatever of any mineral poison, though those analyses have been many times repeated by able professors. The characteristics of the cheese, too, though not such as to attract much attention, are all similar and uniform in all the cases, no matter how widely scattered. It appears riper and richer than usual for its age, has a salvy and fatty appearance, and a strong flavour that is rather acid. Such are the common points of the descriptions so far as received.

The symptoms are equally uniform. Pain in the stomach and nausea, and vomiting in moderate cases; extreme distress and cramping in severe ones, followed with diarrhæa; death rarely,

and only in extraordinary cases. The symptoms generally appear within three hours, and are in most cases very intense. As a little five-year-old boy, who was poisoned last summer in Batavia, expressed it, they are "awful sick." It is a very singular fact, in most of the cases that have come to my knowledge, that though the poison is so very virulent in some stomachs, others can eat of the same cheese that is so poisonous to some, without any deleterious effects, especially after it has stood a few days with the cut surface exposed to the air.

Cases of cheese poisoning are becoming quite common, much more so than is generally supposed. Interested parties have preferred to hush them up rather than publish them, for fear of the effect upon the consumption and price of cheese. But this is hardly a fair way of treating the matter. Better face the difficulty squarely; better take the beast by the horns, and master it if we can.

The poison in cheese appears to be very variable in its efficacy. Besides affecting persons differently, cases may be observed of every conceivable shade of strength, from slightly nauseating to those that produce the extremest symptoms. It may be interesting to refer to some of the severer cases that have lately occurred. In St. Lawrence County, New York, a case occurred in October, 1869, that was noticed at the time by Mr. Willard in the *Rural New Yorker*. From the account there published it appears that the poisoned people traced the cheese, through the dealer who purchased it, back to the dairy, where nothing in the making, or about the dairy, was different from usual. All appeared cleanly, and everything done in the usual manner.

"No deaths," he says, "came from eating the cheese, but the persons who ate of it were taken suddenly ill with pains and cramps, and excessive vomiting, showing evident indications that they had been poisoned." Samples of this cheese were sent to Professor Jackson, of Boston, who, after a rigid examination, reported, as usual, no poison found in any of the samples, but appended the following to his report: "But there is a small proportion of offensive putrifying animal matter, which has been separated here, that does not belong to good cheese." Other facts appeared in the account

of this cheese which would be interesting to those who care to investigate this matter. A case appeared in Fairfield, Michigan, last May, the effects of which were more wide-spread and severe. I have no authentic account that any deaths occurred, but a large number of persons were made deathly sick. It was a very serious occurrence, and the most extensive of any that has come to my knowledge. All the cheese made in one of the three vats in a certain factory for three days, not always consecutive, proved to be poisonous. The cheese, when cured, was scattered about the State and out of the State, and spread the poison over a wide extent. Persons partaking of it were made sick in the same way as before described. The effects produced, as the proprietors of the factory related, were nausea, excessive and protracted vomiting, most excruciating pains in the stomach and bowels, followed generally by diarrhæa. And yet, they say, though so many people were made so terribly sick from using this cheese, others partook of it with no unusual effect. A sample of this cheese was sent to Cornell University for Professor Caldwell to analyze. By his kindness a piece of it was presented to me for inspection. It presented no very unusual appearance. It was salvy and rich, and apparently more thoroughly cured than usual for a cheese of its age, being about two months old when I saw it. Though it had ripened rapidly, there was no appearance of huffing, being pretty compact, and exhibiting a few gas holes which were pretty large. It had the same strong, sourish smell that has been said to belong to other poison cheese, but it did not appear to be stronger, I thought, than I had seen in cheese not poison. After inspecting, I ate a piece the size of a hickory nut. It was followed with a little pain in the stomach and feeling of heaviness, as is common in cases of indigestion, which soon passed away, followed by no other effect than offensive breath. The next day I ate more, with less effect; and in a few days, the cheese being exposed to the air all the time, I could partake of it as well as any other cheese, except the unpleasant breath that followed every trial of using. It was not used long enough to determine whether this particularity would also have died away or not.

Professor Caldwell ate of the same, sparingly at first, with no noticeable effect; but increasing the quantity gradually for a few days, vomiting followed, which at the time was thought to result from nothing but an ordinary case of indigestion, but inasmuch as this was one of the customary symptoms of that peculiar poison, I suspect it was due to the cheese.

Last winter a pretty bad case broke out in the City of New York, the particulars of which I have not learned, except that a careful analysis by different chemists in the city failed to find any indication of poison.

Another serious case of the kind is said to have occurred at Anamosa, Iowa, by which a considerable number of persons suffered terribly with the same symptoms that followed the Michigan and other poison cheese.

Five members of a family were, not long since, poisoned in Batavia, N. Y., some very severely, others slightly. Symptoms as usual, distressful vomiting that lasted three hours. The appearance of the cheese was nothing different from usual except the strong odour before mentioned, and also quite ripe and rich. It was highly coloured, and said to be a Hamburg cheese.

These instances are sufficient to show the general character of the cheese and its effects. They are some of the strongest cases that to my knowledge have transpired. The milder cases that are occurring more frequently about the country seldom attract attention, or are even suspected of having a poisonous character. But I find them quite often, especially in low situations, and I conclude that cheese buyers do also, for I notice that in trying cheese they seldom *taste*, because they soon find that tasting, to use a mild expression, does not agree with them; and I have tasted enough to understand why. Similar cases have also occurred in Europe. Dr. Voeclker reports having analyzed several samples with no more satisfactory results than have been obtained in this country. The description he gives of the cheese is the same as is given of poison cheese here. It is rich and fatty, and strong and acid, and its use is followed by the same results. The cause is evidently the same there as here, and chemical analysis there, as well as here, have

settled one point pretty conclusively, viz: That it proceeds from no mineral or other poison that the chemist can reach. It is of some other character; something that dissolves in his crucibles and eludes his search. What, then, can the cause be? is a query that will very likely be raised in the mind of every hearer. But to that query I can only reply as Agassiz did, when he was asked if the human race had a plurality of origin: "I wish I knew."

I propose now, for a short time, to call your attention to some of the circumstances that might be supposed to vary fermentation in cheese, that you may judge for yourselves whether there is any probability that the poison originates in that quarter.

The subject of fermentation in connection with the dairy interest, is both interesting and important. Everything in cheese-making goes on by fermentation. By fermentation we curdle the milk and extract the whey; fermentation ripens the curd in the vat; and the conversion of that curd into cheese in the curing-room, whether it be palatable or unpalatable, wholesome or unwholesome, is the work of fermentation only. This subject was very clearly and ably presented to this Association two years ago, and by those who heard it is doubtless well remembered now.

Every one present, it may be presumed, has a general idea of the nature of fermentation; but I may remark in passing, that the changes it occasions are always accompanied with the growth and development of myriads of living microscopic fungus plants, and that their growth and multiplication are regarded as the *cause* of the changes produced, and that these microscopic plants, or rather the germs or spores from which they originate, take the general name of *ferment;* so that when the terms ferment and fermentation are used, you will refer them back in your mind's eye to the germs as the moving cause.

I may further remark in regard to these fungus plants, that they are susceptible of great variation from changes in temperature, or from the composition of the substance in which they may grow. It is the same species of fungus, growing under different circumstances, that raises our bread, makes alcohol, beer, vinegar, wine, and cheese. This fact has some significance in looking for the

cause of poison cheese. If changes occur from a change of conditions, if the same germs by a change of circumstances can be made to produce wholesome cheese in one case, and alcohol in another, it will require no very great stretch of the imagination to suppose that they *might* be so varied as to produce some *other* poison; and it is possible, at least, that the poison in cheese may be thus originated. The variations in cheese from temperature alone are very great. If two green cheeses from the same vat are placed to cure, one in a temperature of 70 deg. and the other 50 deg., the one may become a fine, palatable cheese, the other bitter, offensive and unwholesome. But I must not stop to trace the changes further. I must turn to the examination of milk as the more probable cause of contamination, and from the crucibles of the chemist I appeal to the microscope to aid in the investigation.

I have prepared here some illustrations to show how milk appears, both in its natural and diseased condition, when viewed with the microscope, and also to show some of its natural, as well as unnatural, ferments, and how the latter get into it.

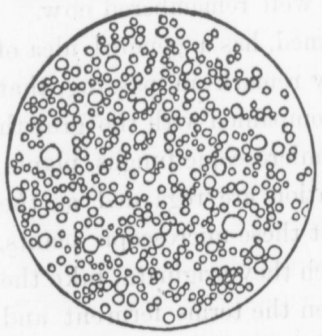


Figure 1 is a greatly enlarged view of the cream globules as they appear in healthy milk. It was taken from the milk of a large number of cows mixed. I wish you to take notice of the great inequality in the size of the globules, as it is an evidence of its healthy condition. This inequality may be a little greater than is common, the sample being taken from the milk of a large number of cows mixed together. The globules in some cases are much larger than in others, but I have seen a difference even greater than this in the milk of a single cow. You will notice also how evenly they are distributed over the view. This is another evidence of healthfulness. In healthy milk the globules are not only evenly distributed through the milk, but they are separate from each other, and move about in the watery mass in which they are suspended

with as much freedom and mobility as the particles of the liquid in which they float.

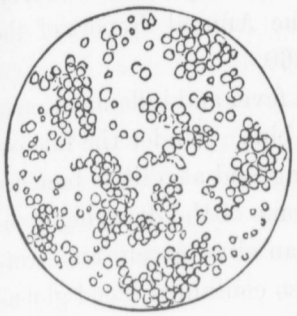
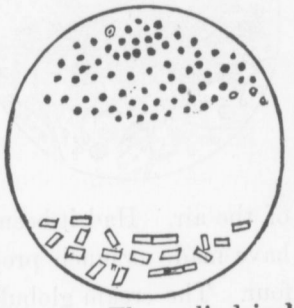


Figure 2 shows a sample of tainted milk, with the globules nearly all in clusters. This was caused by a little fever in the cow. When cows become feverish from any cause, as improper food or water, or exposure to too much hot sun, or by worrying with dogs or flies, their milk under the microscope takes on this appearance. The cream globules change at once when fever occurs, and, probably from incipient decay, their surfaces become viscid and adhesive, and they stick together in little bunches or clots, and make cream appear thick and ropy.



Milk, whether healthy or unhealthy, always contains more or less organic germs that acts as ferments. Those peculiar to healthy milk are represented by figure 3. The circular ones, on the upper part of the illustration, are what are called Micrococcus cells, or spores, and are always present in the milk when it is sweet, and are in it when drawn from the cow. The cylindrical ones, on the lower part of the view, are the germs concerned in the production of sour milk. They are the same species as those above. They have only assumed a new form from the altered condition of the milk. They are the only germs that necessarily belong to healthy milk. Others will be shown by-and-by.

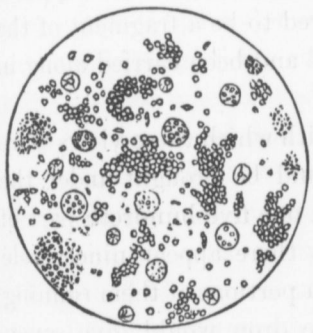


Figure 4 exhibits an aggravated case of diseased milk. It was drawn from a sick cow in a distillery stable in Williamsburg, at the time of the notorious swill-milk exposition in the city of

New York, in 1858 or 1859. The view is taken, as are three others, from a microscopic representation made by Dr. S. R. Percy, of New York City, as it appears in the Annual Report of the New York State Medical Society for 1860.

The sickness of the cow was very high fever and inflammation of the bowels. The milk was scanty and blue. Under the microscope it showed the milk globules cohering, and also little bunches of them broken down and decaying. Some of the decaying globules showed a yellow colour; others of an olive green, and scattering spores of confervæ. The milk also contained blood globules, which do not appear in the drawing.

Figure 5 is a view of a sample of the same milk, after standing closely corked for twenty-four hours. You see the spores of confervæ have grown to perfect plants, with branching stems. They afford a good illustration of the rapid growth of ferments in closely covered vessels. This progress was made in twenty-four hours at the temperature of the air. Had it been warm and slightly agitated, they would have made as much progress in one hour as they did in twenty-four. The cream globules have been omitted in this drawing for the sake of distinctness. They appeared the same as in the other view. There were also the clusters of decaying globules, and those of a green and yellow colour. Blood globules with a dark centre were also seen; and at the upper side on the right hand appears a mass of reddish matter, which appeared to be a fragment of the mammary gland, that had sloughed off and been carried along in the milk.

Under the high magnifying power with which these views were inspected, but a mere speck of milk could be brought under the field of vision—probably not more than one five-hundreth part of a drop—and yet in this small amount there appear nine whole plants and six parts of plants, the unseen portions of them running outside of the view. This, for a whole drop, would give seven

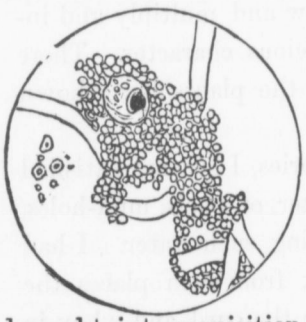
thousand five hundred plants and parts of plants. This may give some idea of how numerous they were in the body of the milk. These are extraordinary cases, such as do not often occur in the country. I have introduced them here, not from any fancied connection with poison cheese, though the hygienic effect of this milk was somewhat analagous to that of poison cheese. Wherever I have learned the particulars of poison cheese, it has appeared that children have sickened under its use more readily than adults; the feeble sooner than the strong; and so with this diseased milk: children were made sick with it and infantile death followed in its train, when adults ate it without complaining. I have introduced them here, first, because they confirm my own observations in regard to the cohesion of the cream globules of tainted milk; and, second, because they show the termination of disease in milk, the incipient stages of which are very common; and, third, because they corroborate what I have before believed to be true, viz: that the germs of fungus plants, which in their growth become ferments, may be, and often are, taken into a cow's stomach in her food or drink, or even in her breath, and pass into her blood and thence into her milk, where they grow and multiply and inoculate with disease if they are of a malicious character. There can hardly be a doubt that the germs of the plants here shown were derived from the distillers' slops.

Early in my experience in cheese factories, I became satisfied of the transfer of ferments from the water of pools, mud-holes, swamps, &c., into the milk of cows drinking such water. I had noticed repeatedly that when cows drank from such places the peculiar smell of the water reappeared in the curd and whey in the advanced stages of the curding process. It did not often appear in the milk when it first came to the factory; but when it came to be warmed up, and especially when it approached blood heat, the exact odour of the stagnant water increased with great rapidity. It was not one uniform odour that appeared on every such occasion, but each swamp, mud-hole, or pool, from which the cows happened to drink, reproduced its own peculiar smell in the ripening curd and warm whey, giving satisfactory evidence that

the germs which had given flavour and odour to the water had, with their vitality retained, passed, in each case, to the milk of the cow and by their marvelous multiplication developed their peculiar effects in the warm curds and whey.

From such observations I had become so thoroughly convinced of the passage of living spores into the milk of cows from bad water and food and air, that I had determined, so soon as I could procure a suitable microscope for the purpose, to test the fact by ocular demonstration. You can easily imagine, then, with how deep a satisfaction I received the following facts from Professor James Law, of Cornell University, with permission to copy the sketches he had made for his own use, which are presented to your inspection to-day. They afford the desired proof, and their application comes directly home to us as dairymen.

On the first day of October, 1870, a man who regularly furnished the people of Ithaca with milk, left some of his goods at the house of Professor Law. It was set away for the cream to rise, which, when it came to the surface, did not appear just right; it was more adhesive than usual, and half inclined to be ropy. Others might not have noticed any peculiarity; indeed, I have not learned that any one else observed anything unusual, though other parties were furnished from the same vessel. But under the observant eye of that distinguished Professor, such a fact could not be allowed to pass without investigation. The microscope was brought into requisition, and here is what it revealed. The first thing that will strike your attention is this large stem of a fungus plant. Whence the spore of that plant reached the milk was a mystery that needed a solution.

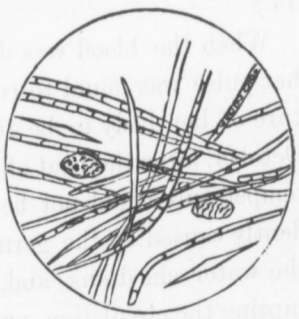


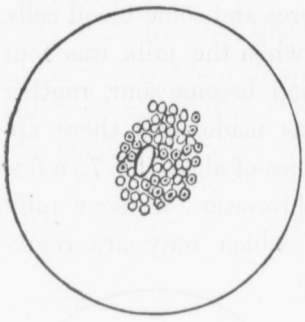
The next thing to notice is the great adhesion of the milk globules. They are closely stuck together, all in a mass, and overlapping each other and apparently piled up, so as to cover the fungus stem. This is a striking characteristic of tainted milk. Then there is a large spore lying bare on the adhering globules;

and out a little aside are a few small spores and some blood cells.

On the 5th, when the milk was four days' old, and had become sour, another examination was made, and there appeared two species of algæ, (fig. 7,) a few spores and arthrococcus, or sour milk cells, a few of which only are represented. On the 8th a further examination brought similar results, (as shown on figure 8.)

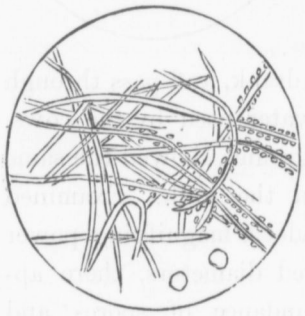
Did the spores from which these plants sprung come from the water with which the milk vessels were washed, and, adhering to their sides, infect the milk and fill it with their numerous progeny? or did they come from the water the cows drank, and pass through their blood to reach the milk? The water used by the cows, and which made its way over the mossy ground, showed the same germs found in the milk. Examined October 9th under a magnifying power of three hundred diameters, there appeared an abundance of spores and diatoms, the latter only being common to spring water. (Fig. 9.) After standing closely corked thirty days, full grown plants like those found in the milk appeared in the water. (Fig. 10.) Having found the same spores in the water the cows drank, and in their milk, it was now desirable to know positively whether they passed through the vascular system of the cows. On the same day, October 9th, blood was taken from one of the cows giving tainted milk, and



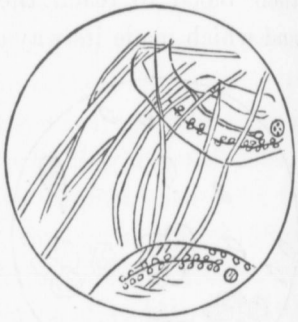


lo! the same kind of spores were seen there. (Fig. 11.) A sample of this blood was kept closely corked six days, and there were developed in it the identical forms that were produced in the milk and in the water from which the cows slaked their thirst. (Fig. 12.) Could any demonstration be more conclusive?

Further experiments were made by putting a drop of blood in an ounce of healthy milk, and shaking it well and corking closely. Three days afterward the milk was filled with the full grown plants. (Fig. 13.)



A drop of water from the spring, shaken with an ounce of pure milk in the same way, and standing the same time, showed the same growth. (Fig. 14.)



When the blood was drawn from the cow, giving tainted milk, her pulse was found to run sixty to the minute, and the temperature of her body to be 102. This, it will be remembered, was in October, after the heat of summer was past, and this extraordinary temperature could not be ascribed to external heat. It was evidently caused by the germs carried into the vascular system from the water she drank, and, acting there as a ferment, and by interrupting the circulation, produced fever. This is a significant item. It is just what happens with cows giving tainted milk, so called, The case investigated by Professor Law was just an ordinary case

of tainted milk, such as occurs every year, and which was so frequent in 1870. From the very first of that kind of milk I met with, down to the last, every instance has been accompanied with indications of fever, so that in this demonstration we have satisfactorily accounted for a large share of the infected milk, and the means of avoiding it are suggested.

The results which have appeared from the facts illustrated, have a direct bearing in relation to poison cheese. That cheese is made poison by unnatural fermentation hardly admits of a doubt. You have seen how the seeds of fungus plants, which act as ferments, reach the milk and infect it. You have seen that cows eating or drinking food that contains spores carry them into their milk, and how quickly they spring into a vigorous growth and change the characteristics of the milk. How often are cows allowed to slake their thirst in swamps or stagnant pools, which always abound in the seeds of miasma, which are sure to produce new or modified fermentation in the milk or resulting cheese. It would seem from what I have shown that there is but little difference between one's drinking from the pool himself, or eating the milk or cheese derived from the cow that has drank the water. It is not so strange, it appears to me, that poison cheese should now and then occur with the chances, which we know exist, of carrying poisonous ferments into it, as it would if it should not occur. Cows are too often exposed to chances of imbibing ferments not to get some poisonous ones once in a while. And then, instead of obviating the difficulty by our treatment of the infected milk, we take the most efficient means to aggravate it.

Some of the fungus plants, whose growth causes fermentation, are so tenacious of life that neither frost, nor wetting and drying repeatedly, will affect them. Of this kind is our cherished friend, the micrococcus cell, that is always in milk, and is so abundant and efficient in rennet, and in digestion generally. But it happens that the organisms that modify unfavourably the fermentation in cheese, maintain life by a more feeble tenure. They can only live under water, or in some envelope that will protect them from the oxygen of the air. Though, like all other plants and animals, they

require oxygen in their growth, they can bear but very little of it. For the same reason that a fish dies when out of water, do these growing fungi perish in the air. Instead of destroying them in the milk, on its way to the factory, we take the most efficient means to cultivate them. We cover our milk cans tightly to protect our enemies from the air, and nourish a serpent in our bosoms. If we would expose milk to the air we would kill, not the germs, or spores, but the growing plants, as soon as they germinate. Nature purifies water in this way. Fungi grow only in still water, for in such only can they be protected from the air. The waves and currents of the mighty ocean are constantly rolling its waters to the surface, to be cleansed by aeration; and the babbling brook as it leaps over its minature cataracts and rolls over, and winds along its pebbly bottom, is cleansed of all that aeration can deroy. If we would all follow the example that Nature has set us, and expose our milk to the air instead of shutting it away, in place of being injured, it would be improved for the purposes of cheese-making by an hour's ride to the factory, and such a thing as tainted milk or poison cheese could hardly exist.

TRANSACTIONS

AT THE

FIFTH ANNUAL MEETING

OF THE

CANADIAN DAIRYMEN'S ASSOCIATION,

HELD AT THE TOWN-HALL, INGERSOLL, ONTARIO,

On WEDNESDAY and THURSDAY, FEBRUARY 7 and 8, 1872.

At half-past eleven on Wednesday morning, the Convention was called to order by the President of the Association, JAMES NOXON, Esq.

COMMITTEE ON ORDER OF BUSINESS.

On motion of Mr. J. W. SCOTT, the Chair was empowered to appoint a Committee of three to present a programme of the Order of Business for the Convention. The Chair named Messrs. GEORGE HAMILTON, B. HOPKINS, and E. V. BODWELL, M.P.

COMMITTEE ON NOMINATIONS.

On motion of Mr. G. HAMILTON, the following Committee of five on Nomination of Officers for the ensuing year, was appointed by the chair: Messrs. J. HARRIS, J. ELLIOT, C. E. CHADWICK, D. PHELAN and DR. COLEMAN.

COMMITTEE ON MEMBERSHIP.

On motion of Mr. JAMES ELLIOT, the Chair appointed Messrs. E. CASWELL, J. M. WILSON, T. BROWN, J. BRADY and T. D. MILLAR, a Committee on Membership.

COMMITTEE ON FINANCE.

On motion of Mr. C. E. CHADWICK, the following Committee of three on Finance was appointed by the Chair: Messrs. B. HOPKINS, G. GALLOWAY and L. HAGLE.

To avoid irregularity and to relieve him from embarrassment, the President suggested that a Committee of five be appointed on Rules of Order.

On motion of Mr. G. HAMILTON, the President appointed the following gentlemen a Committee on Rules of Order: Messrs. C. E. CHADWICK, J. W. SCOTT, E. V. BODWELL, D. PHELAN and GEO. HAMILTON.

On motion, the Convention adjourned to meet at half-past one o'clock p.m.

AFTERNOON SESSION.

The Convention re-assembled at half-past one the President JAS. NOXON, Esq., in the chair.

The Committee on Order of Business made the following report:

1st. The President's Address.

2nd. Prof. Buckland's Address.

3rd. The Discussion of Questions Nos. 1, 2, and 3, in printed Programme.

4th. Adjournment from six o'clock, P.M. to half-past seven.

5th. Receiving reports of Committees until eight o'clock

6th. The Annual Address by X. A. Willard, Esq.

7th. Miscellaneous remarks until adjournment.

8th. On Thursday morning at ten o'clock, Mr. L. B. Arnold's Address.

On motion, the report was received and adopted.

ADDRESS OF THE PRESIDENT.

From the large and efficient staff of lecturers we have engaged to take part in the proceedings of this Convention, I did not think it incumbent on me to prepare a manuscript address. With pleasure and pride I congratulate the Association upon the great success which has attended the dairy interest throughout this Province—a success so plainly observable in the enlargement of dairying operations and in the increased quantity, quality, and value of its products. This happy result is to a large extent, owing to these annual gatherings—to the varied and important information thereby obtained and thereby disseminated.

For a time during last season there was great depression in the cheese market, and serious apprehensions were felt as to the prosperity of the dairy interests, yet I feel satisfied that the result of last year's operations will be generally admitted to be satisfactory. During the period of depression, when prices were at a low ebb, many of my friends who had just started new factories would hardly recognise me—thinking that we had been the means of leading them into undertakings and difficulties out of which they could with difficulty extricate themselves.

June was a very discouraging month. The factories were crowded with cheese, and there was no demand for dairy products. But in dairy business as in other things "the darkest hour is just before the dawn of day." Markets suddenly improved and buyers were ready to pay a fair price for all goods that were shipped, and when the estimates are made up and the balances struck, it will be found that last year's transactions on the whole have been as successful and profitable as those of former years.

The long continued dry weather checked for a time the produce of the dairy, but the result has not been as serious as was then anticipated. There was a cry raised in the early part of the season that, owing to the large increase in the number of factories, the supply would exceed the demand and the markets would be glutted. Many were deterred through these considerations from entering into the cheese manufacture. But their fears were unfounded, and though many new factories have been started, all have profited who have entered judiciously into the business, and cheese-making may now be considered to be one of the most profitable branches of our national industry.

All of you are acquainted with the history of this Association and all—

even those who set their faces against us when the Association was first originated—are now pleased and gratified to witness the success of our efforts and to mark the gradual extension of benefits to the dairying community and to the country at large.

In a financial point of view the Association has also been a success. The revenue for the past year has amounted to upwards of $900, and there remains a balance in the treasurer's hands, after all the expenses have been paid, of $169. The principal expenses incurred have been for printing the Annual Report, and for establishing a cheese fair. For our financial success as well as for the general success of the Association, we are largely indebted to the tact and persevering energy of our Secretary.

To extend our operations and influence as we desired, we found some slight assistance necessary. As an agricultural institution we considered ourselves justified, as well as others, in soliciting a fostering aid from the Government. We asked it and, in consideration of our selling to the Government 500 copies of the Annual Report in which we advertised for immigration purposes, we received $250. This sum we have expended in such a way as we trust will best promote the interests of the Association. At the cheese fair held last Fall, upwards of $300 were distributed in prizes to successful competitors. Those who obtained prizes had answered a list of questions submitted to them by the Executive. These questions and answers are at the disposal of the Convention, and will doubtless be found to contain much interesting and valuable information.

While the Association has heretofore answered all the purposes which its originators had in contemplation, yet to place ourselves more prominently before the country and to take the position which our importance entitles us to occupy, we think it expedient that this Association should become incorporated. We have outgrown our former state and we desire to enjoy, in future, a legal, and not simply a voluntary, existence. We have received encouragement from the Minister of Agriculture to the effect that if the Association becomes incorporated, an annual appropriation of from $300 to $500 might be anticipated.

I would here remark that any documents of value connected with the dairy interest and belonging to the Association, will be available to any of its members.

It is gratifying to witness the improvement in the Convention from year to year, both as regards the numbers in attendance and the intelligence and ability displayed in the discussion of the various subjects

brought before it. I trust the present Convention will be one of great interest and great profit to all. Although we are well supplied with men of ability and talent who will give us the benefit of their extended knowledge and experience, I regret that Prof. Buckland, who had promised to be with us, will not be able to attend on account of illness. It remains with you to decide how the time allotted by the Committee for the delivery of his address shall be occupied by the Convention. I feel assured that the duties pertaining to the position which I occupy will not be very arduous. I do not think that delegates will manifest the same backwardness in addressing the Convention as on former occasions, Their tongues will be loosened and all who are posted will readily come forward and give what information they can connected with the subjects under discussion. We feel that we have a right to call upon any member to give his views in regard to any subject brought before the Convention. I shall insist upon the rule of taking no excuse from any member. Not being a practical dairyman myself, it will hardly be expected that I should add much to your stock of information on dairying interests. I am willing at all events, to be a listener and a learner and, as far as my experience goes, to contribute what I can for the benefit of the Association. I have no desire further to occupy your time, but will proceed at once with the business of the Convention. As Prof. Buckland is unavoidably absent, I leave it to the Convention to say how the time devoted to the delivery of his address may be otherwise occupied.

Mr. E. V. BODWELL said that the absence of Prof. Buckland was a great disappointment to him, and doubtless also to the Convention generally. He would move that the time be occupied in reading the answers of the successful competitors at the late Cheese Fair, to the code of questions submitted to them.

The Secretary then read the following answers to the following questions.

QUESTIONS.

To be answered by parties exhibiting cheese at the Cheese Fair to be held in Ingersoll on the 21st and 22nd of September, 1871.

No. 1.

1. Name of Factory?—Ontario.
2. Name of Exhibitor and P. O.?—H. S. Losee, Norwich.

3. Name of Cheese-maker ?—Mrs. H. S. Losee.

4. Date of each cheese shown ?—July 17, 20—August 15, 16—September 4, 5.

5. The ordinary milk of how many patrons was used in making these cheese ?—Forty.

6. Were these cheese made by mixing nights' and mornings' milk ?—They were.

7. If made twice a day, was the milk cooled before setting ?—It was.

8. Temperature of milk at setting ?—84 degrees.

9. Describe method of cutting curds ?—With perpendicular knife cut lengthways of vat and crossways; let the curd settle; then cut with horizontal knife; then apply heat.

10. Highest temperature of scalding curd and time required in scalding ?—98 degrees—1½ hours applying heat.

11. Is the curd or whey soured before dipping ?—It was.

12. What tests or means are used to ascertain when curds are ready for dipping or "come out" ?—Apply to a hot iron, when ready it will draw out in numerous fine fibres, ½ inch long.

13. What kind of rennets were used ?—C. P.

14. What kind of annatto was used ?—Michell's.

15. What kind of salt ?—Liverpool.

16. Quantity of salt used per 100lbs of curd ?—2 7-10ths lbs to 1000 lbs of milk.

17. Was the curd ground and how many times ?—Not ground.

18. Was curd salted previous to grinding ?—Not ground.

19. Describe treatment of cheese in curing room, temperature, ventilation, &c.—Turn once a day. Temperature, from 65 to 80 degrees, well ventilated from bottom through roof.

No. 2.

1. Name of Factory ?—Black Creek.

2. Name of Exhibitor and P. O. ?—Thomas Ballantyne, Sebringville P. O.

3. Name of Cheese-maker ?—Thomas Grieve.

4. Date of each cheese shown ?—July 18, 20—August 17, 19—September 8, 9.

5. The ordinary milk of how many patrons was used in making these cheese ?—Seventy six.

6. Were these cheese made by mixing nights' and mornings' milk ?—They were not.

7. If made twice per day, was the milk cooled before setting ?—Made twice per day, and cooled before setting.

8. Temperature of milk at setting?—82 degrees.

9. Describe method of cutting curds.—Cut first with perpendicular knife, afterwards with horizontal.

10. Highest temperature of scalding curd, and time required in scalding ?—98 degrees, from one to three hours.

11. Is the curd soured before dipping ?—Soured before dipping.

12. What tests or means are used to ascertain when curds are ready for dipping or "come out" ?—Smell and taste, and occasionally hot iron.

13. What kind of rennets were used ?—C. P. rennets.

14. What kind of annatto was used ?—Michell's.

15. What kind of salt ?—Liverpool factory filled.

16. Quantity of salt used per 100lbs of curd ?—From 2½ to 2 7-10 lbs.

17. Was curd ground, and how many times ?—Was not ground.

18. Was curd salted previous to grinding ?—Was not ground.

19. Describe treatment of cheese in curing room, temperature, ventilation &c.—Turned once per day. Kept as near as possible from 60 to 70 degrees, ventilators in roof of curing room, open spaces in basement floor and intermediate floors.

No. 3.

1. Name of Factory ?—Downie Cheese Factory.

2, Name of Exhibitor and P. O. ?—John Sharman, Jr., Stratford.

3. Name of Cheese-maker ?—Miss C. B. DeLong.

4. Date of each cheese shown ?—July 17, 18—August 16, 18—September 7, 8.

5. The ordinary milk of how many patrons was used in making these cheese ?—Thirty six.

6. Were these cheese made by mixing nights' and mornings' milk ?—Yes.

7. If made twice a day, was the milk cooled before setting ?—Made once a day, milk was cooled.

8. Temperature of milk at setting ?—84 degrees.

8. Describe method of cutting curds ?—Cut with straight and horizontal knives.

10. Highest temperature of scalding curd and time required in scalding ?—98 degrees; time required, one hour.

11. Is the curd or whey soured before dipping ?—Yes.

12. What tests or means are used to ascertain when curds are ready for dipping or "come out" ?—By tasting whey and trying with hot iron.

13. What kind of rennets were used ?—C. P. Rennets.

14. What kind of annatto was used ?—Nicholl's.

15. What kind of salt ?—Higgins's factory filled.

16. Quantity of salt used per 100lbs of curd ?—2·7lbs.

17. Was curd ground, and how many times ?—Not ground.

18. Was curd salted previous to grinding ?—Curd salted in sink as soon as whey run off.

19. Describe treatment of cheese in curing room, temperature, ventilation, &c.—Cheese rubbed and turned every day, temperature as near 70 degrees as possible, ventilators left open in warm weather.

No. 4.

1. Name of Factory ?—Bronk.

2. Name of Exhibitor and P. O.?—Wm. Bensly, Campton.

3. Name of Cheese-maker ?—Wm Bensley.

4. Date of each cheese shown ?—July 19, 21—August 15, 16—September 5, 8.

5. The ordinary milk of how many patrons was used in making these cheese ?—Forty-one.

6. Were these cheese made by mixing nights' and mornings' milk ?—Yes.

7. If made twice a day, was the milk cooled before setting ?—Once a day.

8. Temperature of milk at setting ?—82, 84, 86 degrees.

9. Describe method of cutting curds ?—Once lengthways with perpendicular knife, and twice crossways with a perpendicular knife.

10. Highest temperature of scalding and time required in scalding curd ?—96 to 98 degrees—45 to 60 minutes.

11. Is the curd or whey soured before dipping ?—Perceptibly acid.

12. What test or means are used to ascertain when curds are ready for dipping or " come out ?"—Taste and smell.

13. What kind of rennets are used ?—Patron's rennets.

14. What kind of annatto was used ?—Cake or basket annatto.

15. What kind of salt ?—Dodrick.

16. Quantity of salt per 100lbs of curd?—From $2\frac{1}{2}$ to $3\frac{1}{4}$lbs to 1000 lbs of milk.

17. Was curd ground, and how many times?—Not ground.

18. Was curd salted previous to grinding?—Previous.

19. Describe treatment of cheese in curing room, temperature, ventilation, &c.—Turn daily and grease; temperature according to the atmosphere outside, windows, with ventilators, in each end of the upper room.

No. 5.

1. Name of Factory?—Burgessville.

2. Name of Exhibitor and P.O.?—H. Farrington, Norwich.

3. Name of Cheese-maker?—E. H. Farrington.

4. Date of each cheese shown?—July 18, 19—August 16, 17—September 4, 5.

5. The ordinary milk of how many patrons was used in making these cheese?—Forty.

6. Were these cheese made by mixing nights' and mornings' milk?—

7. If made twice per day, was the milk cooled before setting?—Cooled down to 84 degrees, in July is made twice a day.

8. Temperature of milk at setting?—80 to 84 degrees.

9. Describe method of cutting curds?—Cut lengthways, and then crossways.

10. Highest temperature of scalding curd and time required in scalding?—96 to 98 degrees, two hours.

11. Is the curd or whey soured before dipping?—Curd and whey both soured.

12. What tests or means are used to ascertain when curds are ready for dipping or "come out"?—The hot iron.

13. What kind of rennets were used?—Patron's.

14. What kind of annatto was used?—

15. What kind of salt?—Goderich.

16. Quantity of salt used per 100lbs of curd?—$2\frac{1}{2}$ to $2\frac{4}{5}$lbs.

17. Was curd ground, and how many times?—No.

18. Was curd salted previous to grinding?—

19. Describe treatment of cheese in curing room, temperature, ventilation, &c.?—Turned once a day, temperature 60 to 80 degrees, ventilated through holes in the floor.

No. 6.

1. Name of Factory?—Maple Grove.

2. Name of Exhibitor and P. O.?—Luke Hagle, Warwick.

3. Name of Cheese-maker?—G. M. Harris.

4. Date of each cheese shown?—July 18, 20—August 16, 17—September 8, 9.

5. The ordinary milk of how many patrons was used in making these cheese?—Thirty.

6. Were these cheese made by mixing nights' and mornings' milk?—Yes.

7. If made twice per day, was the milk cooled before setting?—Once and cooled.

8. Temperature of milk at setting?—84 degrees.

9. Describe method of cutting curds?—With perpendicular and horizontal knives.

10. Highest temperature of scalding curds, and time required in scalding?—98 degrees, 3 hours.

11. Is the curd or whey soured before dipping?—Whey soured.

12. What tests or means are used to ascertain when curds are ready for dipping or "come out"?—Smell and taste.

13. What kind of rennets are used?—C. P. rennets.

14. What kind of annatto was used?—Michell's.

15. What kind of salt?—Goderich.

16. Quantity of salt used per 100lbs of curd?—2½lbs.

17. Was curd ground, and how many times?—Not ground.

18. Was curd salted previous to grinding?—

19. Describe treatment of cheese in curing room, temperature, ventilation, &c.?—Turned once a day, heat of room 70 degrees, two ventilators from lower flat through the roof.

No. 7.

1. Name of Factory?—Galloway's.

2. Name of Exhibitor and P. O.?—G. Galloway, Ingersoll.

3. Name of Cheese-maker?—Miss E. J. Schell.

4. Date of each cheese shown?—July 20, 22—August 14, 18—September 6, 8.

5. The ordinary milk of how many patrons was used in making of these cheese?—

6. Were these cheese made by mixing nights' and mornings' milk ?—Yes.

7. If made twice per day, was the milk cooled before setting ?—

8. Temperature of milk at setting ?—82 degrees.

9. Describe method of cutting curds ?—First with perpendicular knife and then with horizontal.

10. Highest temperature of scalding curd, and time required in scalding ?—98 degrees, two to three hours.

11. Is the curd or whey soured before dipping ?—Yes.

12. What tests or means are used to ascertain when curds are ready for dipping or "come out" ?—When they become slightly acid.

13. What kind of rennets were used ?—C. P. rennets.

14. What kind of annatto was used ?—Basket.

15. What kind of salt ?—

16. Quantity of salt used per 100lbs of curd ?—2½lbs.

17. Was curd ground, and how many times ?—Yes, once.

18. Was curd salted previous to grinding ?—No, after.

19. Describe treatment of cheese in curing room, temperature, ventilation, &c. ?—Set on ranges, turned and rubbed once a day, ventilated by windows in gable.

No. 8.

1. Name of Factory ?—Collins'.

2. Name of Exhibitor and P. O. ?—J. Collins, Mt. Elgin.

3. Name of Cheese-maker ?—O. Collins.

4. Date of each cheese shown ?—July 20, 21—August 17, 18—September 4, 7.

5. The ordinary milk of how many patrons was used in making these cheese ?—Eighteen.

6. Were these cheese made by mixing nights' and mornings' milk !—Yes.

7. If made twice per day, was the milk cooled before setting ?—

8. Temperature of milk at setting ?—83 degrees.

9. Describe method of cutting curds ?—Cut lengthways, stand ten minutes; cut crossways, stand five minutes; then stir with one hand and cut with the other till fine.

10. Highest temperature of scalding curd, and time required in scalding ?—94 to 98 degrees, one to three hours.

11. Is the curd or whey soured before dipping ?—Whey soured before dipping.

12. What tests or means are used to ascertain when curds are ready for dipping or "come out"?—Hot iron.

13. What kind of rennets are used?—English.

14. What kind of annatto was used?—Michell's.

15. What kind of salt?—Goderich.

16. Quantity of salt used per 100lbs of curd?—2¾lbs.

17. Was curd ground, and how many times?—

18. Was curd salted previous to grinding?—

19. Describe treatment of cheese in curing room, temperature, ventilation, &c.?—Turn and rub cheese every day.

No. 9.

1. Fame of Factory?—Norwich,

2. Name of Exhibitor and P. O.?—John Sackrider, Newark.

3. Name of Cheese-maker?—J. Sackrider.

4. Date of each cheese shown?—July 17, 18—August 18, 19—September 6, 8.

5. The ordinary milk of how many patrons was used in making these cheese?—Forty-eight.

6. Were these cheese made by mixing nights' and mornings' milk?—Yes.

7. If made twice per day, was the milk cooled before setting?—

8. Temperature of milk at setting?—82 degrees.

9. Describe method of cutting curds?—In July, 45 minutes from setting; in August and September, 2 hours.

10. Highest temperature of scalding, curd and time required in scalding?—96 to 98 degrees, in July 4 hours, in August and September 6 hours.

11. Is the curd or whey soured before dipping?—Yes.

12. What tests or means are used to ascertain when curds are ready for dipping or "come out?"—Hot iron.

13. What kind of rennets were used?—Imported by E. Caswell.

14. What kind of annatto was used?—Michell's.

15. What kind of salt?—Liverpool.

16. Quantity of salt used per 100lbs of curd?—2¼lbs for July, 2lbs for August and September.

17. Was curd ground, and how many times?—Ground once before pressing.

18. Was curd salted previous to grinding?—One half salt on before grinding.

19. Describe treatment of cheese in curing room, temperature, ventilation, &c. ?—Treatment variable, temperature 75 to 90 degrees, ventilation from below by openings in floor.

No. 10.

1. Name of Factory ?—Honey Grove.
2. Name of Exhibitor and P. O. ?—John Hart, Hampstead.
3. Name of Cheese-maker ?—Miss Margaret Murray.
4. Date of each cheese shown ?—July 18, 21—August 18, 19—September 8, 9.
5. The ordinary milk of how many patrons was used in making these cheese ?—Eighteen.
6. Were these cheese made by mixing nights' and mornings' milk ?—Yes.
7. If made twice per day, was the milk cooled before setting ?—
8. Temperature of milk at setting ?—82 Fahr.
9. Describe the method of cutting curds ?—Cut into half-inch cubes with perpendicular and horizontal knives.
10. Highest temperature of scalding curds, and time required in scalding ?—98 degrees, 60 to 80 minutes.
11. Is the curd or whey soured before dipping ? - Acid developed in whey.
12. What tests or means are used to ascertain when curds are ready for dipping or "come out" ?—Taste and hot iron.
13. What kind of rennets were used ?—Imported.
14. What kind of annatto was used ?—Michell's.
15. What kind of salt ?—Factory filled.
16. Quantity of salt used per 100lbs of curd ?—2½lbs.
17. Was curd ground, and how many times ?—
18. Was curd salted previous to grinding ?—
19. Describe treatment of cheese in curing room, temperature, ventilation, &c. ?—Temperature 60 to 80 degrees, cheese turned and rubbed six times per week.

No. 11.

1. Name of Factory ?—Sagers'.
2. Name of Exhibitor and P. O. ?—James Sager, Troy.
3. Name of Cheese maker ?—W. Dykeman.

4. Date of each cheese shown?—Made according to rules of exhibitors.

5. The ordinary milk of how many patrons was used in making these cheese?—Thirty-nine.

6. Were these cheese made by mixing nights' and mornings' milk?—Nights' and mornings' milk mixed.

7. If made twice per day, was the milk cooled before setting?—

8. Temperature of milk at setting?—84 degrees.

9. Describe method of cutting curds?—As nearly square as possible.

10. Highest temperature of scalding curds, and time required in scalding?—98 degrees, two hours.

11. Is the curd or whey soured before dipping?—Dipped sweet.

12. What tests or means are used to ascertain when curds are ready for dipping or "come out"?—Feel and taste.

12. What kind of rennets was used?—Bavarian.

14. What kind of annatto was used?—Wilson's and Haskett's.

15. What kind of salt?—J. Vedin & Son's factory from E. Caswell's, Ingersoll.

16. Quantity of salt used per 100lbs of curd?—2½lbs.

17. Was curd ground, and how many times.?—Not ground.

18. Was curd salted previous to grinding?—

19. Describe treatment of cheese in curing room, temperature, ventilation, &c.?—Cheese turned and rubbed every day; temperature about 70 degrees; free ventilators through each floor and roof.

No. 12.

1. Name of Factory?—Culloden.

2. Name of Exhibitor and P. O.?—E. Hunter, Verschoyle.

3. Name of Cheese-maker?—E. Hunter.

4. Date of each cheese shown?—July 17, 20—August 14, 18—September 5, 8.

5. The ordinary milk of how many patrons was used in making these cheese?—Thirty-nine.

6. Were these cheese made by mixing nights' and mornings' milk?—In July and September made by mixing milk.

7. If made twice per day, was the milk cooled before setting?—In August, made of new milk and cooled before setting.

8. Temperature of milk at setting?—83 degrees.

9. Describe method of cutting curds?—Cut one way and let stand for 15 minutes, then cut the other way till finished.

10. Highest temperature of scalding curd, and time required in scalding?—98 degrees, three to four hours.

11. Is the curd or whey soured before dipping?—Whey soured.

12. What tests or means are used to ascertain when curds are ready for dipping or "come out"?—Generally a hot iron.

13. What kind of rennets was used?—Bavarian and C. P. rennets.

.4 What kind of annatto was used?—Michell's and Nicholl's.

15. What kind of salt?—Factory filled and Clinton Salt.

16. Quantity of salt used per 100lbs of curd?—2½lbs.

17. Was curd ground, and how many times?—Ground once.

18. Was curd salted previous to grinding?—About half the salt previous to grinding.

19. Describe treatment of cheese in curing room, temperature, ventilation, &c.?—Turn and rub once per day, 70 degrees, no ventilation except by the windows.

No. 13.

1. Name of Factory?—Sidney Town Hall.

2. Name of Exhibitor and P. O.?—P. Frederick, Belleville.

3. Name of Cheese-maker?—P. Frederick.

4. Date of each cheese shown?—July 18, 20—August 16, 18—September 6.

5. The ordinary milk of how many patrons was used in making these cheese?—Six hundred.

6. Were these cheese made by mixing nights' and mornings' milk?—Yes.

7. If made twice per day, was the milk cooled before setting?—No, did not make twice.

8. Temperature of milk at setting?—84 to 86 degrees.

9. Describe method of cutting curds?—Cut twice over with horizontal knife.

10. Highest temperature of scalding curd, and time required in scalding?—102 degrees, two hours.

11. Is the curd or whey soured before dipping?—Slightly turned.

12. What tests or means are used to ascertain when curds are ready for dipping or "come out"?—By the smell.

13. What kind of rennets was used?—Patrons' and Butchers'.

14. What kind of annatto was used ?—Nicholl's paste.

15. What kind of salt ?—Goderich.

16. Quantity of salt used per 100lbs of curd ?—2¾lbs.

17. Was curd ground, and how many times ?—Do not use a mill except when milk is bad.

18. Was curd salted previous to grinding ?—No.

19. Describe treatment of cheese in curing room, temperature, ventilation, &c. ?—Turned every day except Sunday, 70 degrees, no ventilation, but should have.

No. 14.

1. Name of Factory ?—Fullarton.

2. Name of Exhibitor and P. O. ?—Wm Huxley, Fullarton P. O.

3. Name of Cheese-maker ?—Wm. Huxley.

4. Date of each cheese shown ?—July 20, 21—August 18, 19—September 8, 9.

5. The ordinary milk of how many patrons was used in making these cheese ?—Thirty-six.

6. Were these cheese made by mixing nights' and mornings' milk ?—Yes.

7. If made twice per day, was the milk cooled before setting ?

8. Temperature of milk at setting ?—82 to 84 degrees according to temperature of atmosphere.

9. Describe method of cutting curds ?—Cut first with perpendicular knife, afterwards with horizontal.

10. Highest temperature of scalding curd, and time required in scalding ?—96 to 98 degrees, one to two hours.

11. Is the curd or whey soured before dipping ?—Yes.

12. What tests or means are used to ascertain when curds are ready for dipping or "come out" ?—Taste, smell, colour of whey, and hot iron.

13. What kind of rennets was used ?—English imported.

14. What kind of annatto was used ?—Michell's fluid.

15. What kind of salt ?—Liverpool factory filled.

16. Quantity of salt used per 100lbs of curd ?—2 to 2¾lbs according to acid.

17. Was curd ground, and how many times ?—Not ground.

18. Was curd salted previous to grinding ?—

19. Describe treatment of cheese in curing room, temperature, ventilation, &c. ?—Turned once a day, kept as near as possible from 60 to 70 degrees, ventilation only by the windows.

The following is the list of successful competitors for prizes at the Ingersoll Cheese Fair, held in September, 1871.

First Prize—H. S. Losee, Norwich.
Second Prize—Thos. Ballantyne, Sebringville.
Third Prize—Jno. Sharman, Jr., Stratford.
Fourth Prize—Wm. Bensley, Canifton.
Fifth Prize—H. Farrington, Norwich.
Sixth Prize—Luke Hagle, Arkona.
Seventh Prize—G. Galloway, Ingersoll.
Eighth Prize—J. Collins, Mt. Elgin.
Ninth Prize—J. Sackrider, Newark.
Tenth Prize—John Hart, Hampstead.
Eleventh Prize—Jas. Sager, Troy.
Twelfth Prize—E. Hunter, Verschoyle.
Thirteenth Prize—P. Frederick, Belleville.
Fourteenth Prize—William Huxley, Fullarton.

The President suggested that these questions and answers would appear in the printed Report, and would thus be accessible to all.

The next subject taken up was the discussion of Question No. 1., in the printed programme.

1. Tainted Milk—Has there been any improvement in the condition of the milk delivered at the factories as compared with the previous years, and what means should be used to secure further improvement?

Mr. James Harris, being called upon by the President, came forward and opened the discussion. He did not know why he had been called upon, unless to give the smallest a chance before the field of discussion had been exhausted by abler speakers. There are those before me far more experienced and far more practical. The question of tainted milk is a most important one, and I am sorry to say that I am so incapable of thoroughly ventilating it. It is the root of the whole matter, and forms the basis of the vast structure of the cheese business.

There are many things which may cause taint in milk. Sometimes it becomes tainted before leaving the udder, especially in the hot months of July and August. And after it is drawn from the cow, it is put into close cans and carried long distances to factories, when the thermometer

stands at 80, 90, or 100 degrees. Under such circumstances, it cannot but be affected. The uncleanliness of bad milkers is another fruitful source of tainted milk. I refer to the habit of some milkers, whom I have seen dipping their hands in the milk or wetting them with it as it comes from the udder, and then permitting the filth, washed from the teats, to drop into the pail. Some milk is sent to the factories without being properly strained. Milk must necessarily taint, if not properly treated by the patrons before it leaves their hands. The heated state in which milk comes to the factories during warm weather requires that it should be cooled down, before it is fit for making cheese. When large quantities are put together into the vat—sometimes as much as five or six hundred gallons—from the time required to cool this immense mass, together with the time that has already transpired before it reaches the factory, the milk is liable to become tainted. Another source of taint is, allowing cows to drink stagnant impure water during the dry season. How can we expect milk, which contains 87 per cent of water, to be pure, when the water which the cows drink, is so impure that they would turn from it in disgust if not compelled by sheer necessity to drink it? I remember, when I was a boy, that those who emigrated to the Western States were almost invariably attacked with fever and ague—the effects of the bad water. And is it not natural that the lower animals would be more or less affected by a similar cause? I think I have sufficient evidence to convince you that this is the case. At one time when we were badly troubled with floating curds, we sent one of our cheese-makers to New York State to visit the factories there, and to ascertain if possible the cause of this bane of the cheese-maker. He visited many of the best factories in the state, many of which never had tainted milk or floating curds. On examining the pasturage which supplied milk to these factories, he invariably found that the cows had access to pure spring water or running brooks. On the other hand he found that where factories were supplied with milk from low, flat pasture lands, abounding in stagnant pools, the milk was usually more or less tainted and the cheese of an inferior quality. From my own observation and experiments on this subject, I am thoroughly convinced that on the quality of the water supplied to the cows, depends, to a large extent, the quality of the cheese produced from the milk. As factorymen and patrons we ought to know whether dairying pays or not. If not, discard it as a business. But we are all convinced that it does pay, even better than farming, and that its profits will increase in a faithful proportion to the quality of the product. The groundwork of cheese-making is the milk,

and, if that is not good, it is impossible to make good cheese. A first-class article cannot be made from poor material.

I referred to the heated state in which milk frequently comes to the factory, and to the necessity of its being cooled down before making it into cheese. The cooling should be done previous to its being brought to the factory. The milk should be cooled as soon as possible after being taken from the cow, and it can be done much more quickly in small quantities. We have experimented upon a patent method of cooling milk—the invention of a Toronto gentleman, and found it to work admirably. The cheese made from milk two days old, cooled by this method, was fully as good as that made from new milk, and that which was not so treated, was not fit to be made into cheese at all. So if we could only induce patrons to cool and ventilate the milk properly while in small bulks, the practical cheese-maker would have little difficulty in making a first-class article. Cleanliness should be attended to by every one connected with the dairy or factory. Every vessel that comes in contact with the milk should be kept scrupulously clean. Cans should have as few seams as possible, and even these should be soldered smoothly. A little carelessness on the part of a few patrons may result in spoiling, or at least in deteriorating a whole batch of cheese. Sour milk will not make as much cheese by ten per cent as sweet milk, and the price of the product will be at least ten per cent less. All these things must be carefully attended to, if we expect to get rid of tainted milk and to raise the standard of our cheese so as to command the highest price.

The PRESIDENT said that he was sure the Convention would be glad to hear from an old and experienced dairyman on this subject, and he would call upon Mr. Farrington, of Norwich.

Mr. H. FARRINGTON said, the question asked if there had been any improvement during the past year. If the increased interest which I see everywhere manifested in the subject; if the signs before me be any criterion; there has certainly been an improvement. If straws show which way the wind blows, so do roses and ribbons and feathers. We have never before, at any of our Conventions, had such a large attendance of ladies, and this I regard as an infallible proof of our advancement. Preachers now-a-days always avoid preaching the same sermon in the same place, but they preach the same doctrine. That shall be my ground of justification in going over the course that has been already traversed. Mr. Harris has made strong, but true statements, and all of which I am prepared to endorse.

He has intimated that, by cooling the milk we shall improve the quality of the cheese. But that is only assertion. I think, however, that the statement is susceptible of proof and that the proof of it may be found in every factory in the country. During the cool part of the season, through May and June, we are not troubled with floating curds, though there may be just as much filth as in the hotter months. I believe it is the practice of every one—nay it seems to be the promptings of a natural instinct, to look well to the cleanliness of the utensils when the weather is warm. This seems to be a proof that heat is one of the causes of floating curds, that it is the main agent in setting the leaven to work. Hence everything possible should be done to have the milk properly cooled before it goes to the factory. During the hot months of July and August the cows, irritated by the heat and flies, are driven, perhaps to the woods and swamps to eke out a scanty subsistence on weeds and swamp grass of various kinds. This is bad for the milk, and hence arises the greater necessity of cooling and airing it. But why should we air the milk? For the reason that much of the noxious gas is volatile and will pass off during ventilation. I cannot here discuss the different methods of ventilation. Some means of cure will be devised when the disease is known. That the milk, too is sometimes bad before it is taken from the cow, can I think, be proven beyond dispute. The temperature of milk in its normal healthy state, before leaving the cow is 98 degrees. It is well known that this temperature is often raised to 105 or 106 degrees. Fever heat is 110 degrees and certainly 105 is approaching it, and in either case the milk cannot be in a healthy condition. We cannot completely bring back the milk from its fever heat, produced by irritation and other causes, to a perfectly healthy state, but we should endeavour to approach it as near as possible. All we can do is to permit the volatile matter to escape and reduce the temperature. If this be not done before the milk goes to the factory, the taint will generally get the start of us. It should be our object to remove at once the conditions of change. If milk be reduced below 60 degrees with ice or water, it will remain *in statu quo*, and no perceptible change will take place amongst its constituent elements. I may add a few words more by way of further explanation. Milk contains a portion of nitrogenous matter, oil, sugar, water, &c. Now the conditions necessary to change or taint in milk are the presence of nitrogen with moisture and a certain degree of heat, and where these conditions are all present there is no such thing as standing still in nature. Remove either one, and we prevent the possibility of change. It is well known that, if we take water from meat, it will not taint quickly.

Dried beef will keep any length of time without much salt, and it is said that in some parts of Asia, meat is preserved in the atmosphere alone. We cannot however, remove the nitrogen or the water from the milk without destroying its identity. but we can remove the heat. This is the element or rather the condition which we must remove if, during the hot months, we would preserve the milk unchanged and untainted.

Mr. RAYMER, of Markham, thought that the action of the sun upon the milk was very injurious and caused it to taint. We recommend our patrons to let the cans stand in the shade with the covers off. Under the shade of trees would probably be the best situation as in those circumstances there is usually a current of air.

The PRESIDENT suggested that in the multitude of counsel there was much wisdom and that he hoped there would be no hesitation on the part of the members in expressing their opinion on this subject.

Mr. FARRINGTON.—We all know that Mr. Ballantyne took the first prize at the Western Fair at London, last Fall, and no doubt the Convention would like to hear from him on this subject.

Mr. THOS. BALLANTYNE of Downie—Really, I hardly think I can say anything that will add interest to this discussion. Our experience leads us to agree with the previous speakers to the effect that heat has very much to do with tainted milk and floating curds. The milk often arrives at the factory in a tainted condition. The past season has been more favourable than others, owing to the coolness of the summer months. It was in September that we really experienced the most unfavourable weather for the manufacture of cheese. This demonstrates that temperature has much to do in the matter, and yet I am convinced that uncleanliness has more to do with bad flavoured cheese than any other cause. We had an instance of a slightly floating curd during the past year. On examination, it was found that sufficient care had not been taken in the washing of certain cans. I do not think that exposure to sunlight has as much to do with floating curds as a previous speaker seems to imagine. There are patrons drawing milk to our factories over the worst of roads and from very long distances, still, the milk is received in first-rate condition. Hence, I repeat that I believe uncleanliness has more to do with taint than all other causes combined. Mr. Farrington has suggested that we were successful at the London Exhibition. I do not know that, in making cheese, we have any particular method, aside from the exercise of great care in its

manufacture and the employment of good milk. We have small tins corresponding with the number of patrons, a small portion of the milk belonging to each patron is set aside and tested, and if acid is developed sooner than it should be, that patron is requested to send no more milk to the factory. The land where we are situated is low, and is not considered favourable for the production of the finest quality of cheese. As to making once or twice a day, that is merely a question as to the condition of the milk. We make twice a day, but that arises from necessity. Our usual way is, as soon as the morning's milk is received at the factory, to have the agitators at work, exposing it to the atmosphere. We commence work at the morning's milk about eleven o'clock, and at the evening's milk about one o'clock in the morning. Mr. Webb, of New York State, kept a person constantly employed in examining the dairies, to see that the cans, pails, and other utensils were kept in proper condition, and the result of this care and precaution was that they had not a single floating curd. The bad effects of want of cleanliness were chiefly felt in the warm weather; in cold weather the same negligence was not so liable to produce taint. Hence the necessity of reducing the temperature as soon as possible. Milk may be kept for a considerable time unchanged, if cooled down to 55 degrees.

Mr. LUKE HAGLE, of Arkona, said that one of his largest patrons, and one who lived farthest from the factory, kept his Saturday night's milk over till Monday, and then brought it to the factory in excellent condition. There was a beautiful stream of spring water close at hand into which he set his cans of milk.

On motion of Mr. HOPKINS, the question was laid on the table, and the Second Question was taken up for discussson.

2. Deterioration of Cheese—How long can early cheese be held with safety before losing flavour, and what does the experience of the year suggest as to early sales?

The PRESIDENT—No doubt the experience of Mr. Ballantyne would be of value to the Convention as he is both a producer and a buyer, and during the past season has handled a great deal of cheese.

Mr. BALLANTYNE—Candidly, I did not expect to be called upon to say anything on this subject. There are others here far better qualified. I have had a good deal of experience in the purchase of cheese and in placing it in the market. My experience has pointed out to me the desirability of making sales as early in the season as possible in order to suit the English market. If not moved early, say within thirty days, it almost in-

variably goes off flavour, and this result certainly does not suit the taste of the English consumers—a taste which is every day becoming more and more fastidious. Last season on account of the low prices, a considerable quantity of early cheese was held over, and when brought into market was by no means a desirable article. Most experienced makers are aware that early cheese soon becomes rank or otherwise unfitted for the market. We shall thus increase the reputation of our cheese by moving it early. The English cheese cures more slowly, and if we profit by this circumstance, we may have, to some extent, the control of the English market.

Mr. JOHN CRAIG, of Woodstock, said that he had very little to offer in addition to what Mr. Ballantyne had said. In answer to this second question, I cannot state the exact number of weeks or months in which early cheese ought to be moved, but the general experience is, that May, June and July cheese very soon becomes unfitted for the English market. It soon becomes strong and rank, and holders cannot expect to get the prices afterwards which they would have obtained had they sold earlier "Do not send us any strong flavoured cheese" say our British agents in al most every letter we receive from Europe. What is wanted in the English and Scotch markets is a mild, sweet-flavoured cheese. And we have no prospect of receiving a remunerative price at home for a rank and unpalatable article. It is true that early cheese may sometimes command a higher price late in the season, owing to a rise in the markets, but when the expense of keeping, and the labour of turning, and the loss from shrinkage are taken into consideration, there seldom results any real pecuniary advantage. As was remarked by Mr. Ballantyne, there is a great inducement offered to us to make early sales. English-made cheese, not curing as early as ours, does not come into competition, and that market is then open to American produce. During the past season there has been observable, a growing demand in England and Scotland for American cheese in preference to the home-made. This preference, I have no doubt, will be more strongly marked in the future, and makers will reap a pecuniary advantage if, as a rule, they make early sales or whenever their products are fit for exportation.

Mr. E. CASWELL, of Ingersoll, said that all the information and experience he had in the matter convinced him that our cheese in the past had been over-kept, and that it was to the advantage of all parties to make early sales. In the event of early sales, higher prices are generally obtained and better satisfaction is always given. He had been told that old cheese was the best for the English market and most palatable to the English taste

and that the reason why cheese was so low last year was because we sent it too green. This was a mistake. His customers always wanted a mild, sweet-flavoured, free-cutting cheese. He thought the proper time to ship was when the cheese was from twenty to thirty days old. If he could get a supply of that age he would not purchase one fifty days old. By putting cheese into the market early, not only do we frequently gain a cent a pound in the price, but we give makers more time to attend to what is left. We also encourage consumption and make room for that which is later made—thus increasing the probability of a higher price. Some owners during the past season who had kept their cheese, had benefited by a rise in the markets, but this case is certainly exceptional, and we have no guarantee and scarcely any precedent to induce us to believe that the same thing may happen again. Mr. Turner, of New York, requested him to impress upon the Convention the advisability of manufacturing and putting in the market as early as possible during the coming season. Old stocks were going off well.

Mr. FARRINGTON—The gentlemen who have just spoken on this question well understand it, and I agree with them that a mild, close cheese is what is wanted for the English market. In fact these are the peculiarities and the qualities that insure a sale in any market. But they have not told you how to produce these qualities. Mr. Webb, of New York, whose house, perhaps, ships more than any other firm in America, has told me that the cheese which he received during the summer, from nearly all the factories, was off-flavoured. While this fact now stares us in the face, I do not think it is absolutely necessary that it should continue to do so. I have made cheese on the fourth of July, and have kept it to the fourth of July of the following year, on cutting it, it was as free from what dealers call off-flavour as a chestnut. Here is the trouble. If we take the advice of buyers on the subject and get our cheese ready to send off early, we must necessarily make a soft article, which will be off-flavoured before it gets to the other side of the Atlantic. Three or four years ago the American Dairyman's Association, by means of circulars, asked for information on this subject. They were informed that almost every one of the cheese, which had been manufactured between May and October, and which arrived in London, was off-flavoured. Whether the cheese lost its flavour before leaving America, or whether they were injured in the passage, was not known. But the fact of their being off flavoured was indisputable, and the chief reason assigned was the presence of too much moisture in the cheese. The curd should therefore be cooked more, and the moisture

taken out, so that when put into the press, it will not dip like wet mashed potatoes. We must make an article that will stand. The year before I came to Canada, in 1863, we made our first factory cheese. In the Fall, there were prizes offered at the State Fair. We exhibited, and though I have to say it "as shouldn't say it," we took the first, and that on a May cheese. June cheese of the past year, as far as my observation goes, was of better quality than is commonly the case. If you recollect, that month was both cold and dry, hence, there grew a better quality of grass for dairying purposes, a grass that was not too watery. The consequence was an improved quality of cheese. On the other hand, if the season be wet, producing an abundance of juicy grass, we must look well to the manufacture of that season's cheese, and see that the moisture is well taken out of it. As a general thing, June cheese was ready to ship in the worst weather, but, if some of it could be held over and made to carry flavour, it would be better. And if we make June and July cheese fit for shipping in thirty days, buyers cannot then pay remunerative prices for it, and we must sell it for whatever it will bring at that time. The largest dealers in New York say they invariably lose on summer cheese. In many cases it is better to run the risk of selling late, and wait till the cool weather affords better facilities for transportation. Every dairyman should take at least one or more newspapers, and should keep himself properly posted as to markets and stocks, so as to be able to meet any buyer in any month on a footing of equality. It is better to pay $6 for such a purpose, than to lose $100 on a bad sale.

Mr. CASWELL—It is my opinion that every man of common sense should advocate early sales. When I was in Mr Farrington's factory, his June had been kept a long time, and I never saw cheese keep their flavour better. If every one made such a product, it might in some instances be advisable to hold until the prices became more satisfactory. But Mr. Farrington is an exception to a general rule. As an exporter, I know that the English people do not want a cheese that has been long kept.

Mr. D. NORTHCOTE, of McGillivray, took exception to the statement that Mr. Farrington was the only man who could make good cheese to keep. Last November he had taken cheese, made in the early part of the season, to London. It had been retailed through the city and had given general satisfaction. By writing to London it could easily be known whether Mr. Farrington was the only good cheese-maker. His opinion was that cheese might be kept from May till May again without becoming off-flavoured.

Mr. CASWELL—The consumption of cheese at home and abroad is increasing from year to year and the demand is for a sweet, mild cheese. I

have visited factories in which two-thirds of all the cheese was poor. The best cheese is exported, and in consequence of retaining strong and poor cheese we have about spoiled the home market The fact is that we have so vitiated the taste of Canadian consumers that they will not buy.

Mr. BALLANTYNE felt that the question under discussion was of great importance. There appeared to be a great difference in opinion between buyers and manufacturers. He was much more interested as a manufacturer than as an exporter. He had no doubt that double the quantity of cheese would be used by consumers if it were faultless in quality. By keeping the spring and summer make too long, it soon becomes as has been suggested, strong, rank, and off-flavoured, and the consumption is in consequence diminished. If we insist upon such an inconsiderate course, we must make up our minds that our reputation as manufacturers will be affected. Summer cheese does not necessarily go off flavour, but the tendency in the existing state of things is strongly in that direction. Last summer was unusually favourable and should not be taken as a criterion to guide the future. He thought it very desirable that cheese should be shipped as soon as it was ready to be moved. He was not speaking in the interest of any buyer. He had sufficient patriotism to rise superior to selfish interests and to prompt him to be anxious to improve the quality of Canadian products. It has been said that we may manufacture cheese so that it may not ripen too early, but that it may continue a solid, meaty, fine-flavoured article. But it almost impossible to expect our summer cheese to come up to that standard.

Mr. FARRINGTON thought he had been misunderstood. He did not want all the summer cheese kept. What he advised was not to make too much of it soft, as it would then cure too quickly.

Mr. CASWELL—What was the reason, Mr. Farrington, that you sold me July cheese at 9¾ cents, and asked 11 cents for August.

Mr. FARRINGTON—The answer is deducible from what I have already said. There was a report that July cheese sold for fifty-four shillings. My August cheese was well made.

Mr. CASWELL—I have bought June cheese which was excellent at the time the purchase was made, but when it reached my hands it was awfully strong. But so different are tastes as well as opinions in this matter that I have been told by a person in this Convention that old cheese was better than new.

Mr. FARRINGTON—Allusion has been made to August cheese by Mr. Caswell. Much of the bad flavoured cheese of August make had its ori-

gin in the inferior food and water which the cows were compelled to use. The grass being scorched up without nourishment, the cattle would naturally resort to swamps and pools, to coarse water-grass, and browse and bad herbage. What was the consequence? The milk became deteriorated, and the product of it not equal to that produced from good material. There was an evidence of this statement in the improvement in the quality of cheese duriug last season, whenever a fresh supply of food had been produced by rains.

On motion of Mr. HAMILTON, the subject was laid on the table.

The next question taken up was as follows:

3. Butter in connection with cheese making—Can the two be manufactured together with profit, and to what extent, if any, can the cream be taken from the milk without injuring the quality of the cheese?

Mr. FARRINGTON, Jr, of Yates Co., N. Y., was called upon and opened the discussion on this subject. He had come as a listener and was scarcely prepared to speak to the question. He had had considerable experience in making butter and cheese together. He had two factories, and in one, part of the cream was always taken off, while at the other it was not, and the cheese made from the milk partially skimmed invariably sold as high, when sold at the same time, as that made from the whole milk. His object in skimming the milk was simply to make use of the cream that could not be re-incorporated in the substance of the milk, and which, as far as making cheese is concerned, would be be utterly wasted. In factories to which milk was brought from long distances, and especially in some seasons of the year, more or less of the cream would be necessarily lost. It was therefore an important question whether the cream should be taken off and utilized by being made into butter, or whether it should be given with the whey to the hogs. He was aware that in making these statements, he was running in the face of public opinion. Many times had he heard it said "oh! it is skim-milk cheese; it is on that account inferior and we do not want it." It is however, really difficult to distinguish the difference between the two kinds of cheese. In the fore part of the season, at his home factory, a connoisseur in the business had declared that he could detect skim-milk cheese without hesitation or difficulty. A plug from both kinds was presented for his examination, but he actually selected the skim-milk cheese for that from whole milk. At the factory where the cream that rose during the night was taken off, it took to make one pound of cheese 10

27—100ths pounds of milk, while at the other factory and of the whole milk it took 10 17—100ths pounds. In the State of New York they have now a system of creameries where they make part skim-milk cheese and part butter. The milk is kept 24, 48, and in some instances 60 hours, and after all the cream possible was taken off, the cheese were made. This product ordinarily sells low—say from from 4 to 10 cents per pound, of our currency. The butter brings from 30 to 40 cents. The patrons of these creameries by this combination process, get more money for their milk than if it was made into cheese simply. The expense, however, of working the factories is considerably greater. A different process was required in the manufacture of cheese from partially skimmed milk. He also referred to the action of the rennet on the cheese, which he believed not only acted on the milk in the vat, but during the whole process of curing. Where there was a good market for butter, he was convinced that it was more profitable than making cheese. He did not conceive it to be as much an object for us to take much cream from the milk, as in Canada we had not such a good market for butter as was found in New York State. The long distance to a good market must necessarily make the business less profitable. It was of the utmost importance to understand the correct process of both the cheese and butter manufacture. The more perfectly that process is understood, the better will be the quality of our goods, and the more perfect will be our general success.

Mr. FARRINGTON, SR.—I do not believe that whole milk is any too rich for cheese making, but at some seasons of the year chemical changes take place in the milk, and a part of the cream necessarily runs off with the whey. I would take this surplus and make family butter of it rather than give it to the hogs. In fact it will do the pigs no good, and it must be appropriated by us or lost. The reason is that it becomes so soured in the vat and so chemically changed that it is unfit for nourishment. Perhaps it may be that when more of any one ingredient than the system requires is taken into the stomach, it is either wasted or proves injurious. Again, heat-producing material is not wanted in summer, and that is the only purpose which the oil subserves—never assisting in building up the solid tissues of the body. The temperature of the milk and the condition of the cream should be closely watched, and when the cream will not work in, it should be removed. After the middle of October it is very difficult to work in all the cream.

A DELEGATE—Would you recommend that the cream be taken off at home or at the factory?

Mr. FARRINGTON—At the factory, by all means; then you can take off exactly enough, but if it be done by the patrons, too much is apt to be removed.

Mr. B. HOPKINS, of Brownsville, said that he came on the platform merely out of courtesy to the call on his name. He did not intend or desire to make a speech. In our present factory system the taking of cream from the milk was a very dangerous subject for discussion. If at any time it was expedient to take off part of the cream, it certainly should be done at the factory. He thought the less said upon this subject the better for all. Great difficulty is experienced in keeping patrons straight. On the approach of cold weather, the question is often asked "cannot I bring my milk once a day." Necessity and prudence dictated the answer "It cannot be permitted. The milk must be brought to the factory twice a day." He was persuaded that this was the only safe course to pursue. In large factories with seventy or eighty patrons, it would never do to allow any skimming experiments at home. We should be very careful at the outset how the point of such a wedge is inserted. It would certainly lead to bad results.

Mr. S H. LOSEE, of Norwich,—I can give no information in regard to the expediency of making butter and cheese in connection, having had no experience in that respect whatever. In the month of November there is always difficulty in getting the cream back into the milk, but this difficulty might be obviated by increasing the heat. I have tried the experiment of allowing the patrons to skim the milk during one week in November, but I found more difficulty in making good cheese than at any preceding period, I am of opinion that the milk should be delivered at the factory twice a day, and that skimming, if done at all, should be done at the factory.

Mr. W. S. YATES, of Hastings Co., knew nothing of the subject from actual experience, though the question had been raised to some extent in his district. He fully concurred in the opinion that the milk should be skimmed at the factory, if anywhere. If permission be once granted to take cream off at home, the best of milk would be skimmed to death. The advisability of skimming milk in connection with cheese-making was at best, a dangerous question to raise. Besides, he believed that we had a Statute in Ontario prohibiting patrons from sending milk ,from which cream had been removed, to the factories. This would be a serious objection to putting any such theory in practiee. It would probably be punishable by law. In the late season of the year, if the milk is delivered once a day and the two

messes are worked together at the factory, the cream which rises over night and which cannot be re-incorporated, might with advantage be removed. The use of good agitators could, perhaps, obviate part of the difficulty.

Mr. Wm. WILKINSON, of Ingersoll,—With respect to working the cream into the milk again, I think the waste should not be much and that most of it could be re-incorporated. This result was even accomplished before agitators were much in use. If any of the cream be taken off in hot weather you will always have a poor quality of cheese. This, of itself, proves that most of the cream may be utilized in making the cheese.

On motion of Mr. HOPKINS the question was laid on the table, and the Convention adjourned, to meet at 7 o'clock in the evening.

EVENING SESSION.

Convention met, pursuant to adjournment, at 7 o'clock. Shortly after seven, the President called the meeting to order and asked for reports of committees.

The Committee on Order presented a code of rules which was read by the Secretary, and adopted.

The Committee on Nominations presented the following report :—

To the President of the Canadian Dairyman's Association.

Your Committee on Nomination of Officers would recommend for

President—Mr. THOMAS BALLANTYNE, of Downie.

Secretary—Mr. J. H. BELL, of Ingersoll.

Treasurer—Mr. C. E. CHADWICK, of Ingersoll.

Your Committee being of the opinion that the interests of the Association would be promoted by an increase in the number of vice-presidents would recommend that they be increased to twenty, and that the following gentlemen be appointed vice-presidents for the present year :—Messrs. J. W. SCOTT, Lobo ; ROBERT WEEBER, West Zorra ; W. S. YATES, Belleville; H. S. LOSEE, Norwich ; J. LONG, Muskoka ; O. S. PHILLIPS, Newmarket; E. V. BODWELL, M. P., Mt. Elgin ; W. F. CLARKE, Guelph; J. S. PIERCE, Tyrconnell ; JAS. HARRIS, Ingersoll ; LUKE HAGLE, Arkona ; HON. O. BLAKE, Waterford ; Dr. CLINE, Belmont ; JOS. ELLIOT, Peterborough ; X. A WILLARD, Little Falls, N. Y. ; W. FOWLER, Clinton ; JOSEH HUNT, Morpeth ; L. B. ARNOLD, Ithaca, N. Y. ; J. P. DUNN, North Dorchester ; JOHN ADAMS, Nissouri.

Your Committee recommend that the constitution be amended to meet the above.

Your Committe, believing that the business of the Association would be better served by the appointment of an Executive Committee, whose duty it would be to attend to all matters of detail connected with the Association while out of session—said committee to consist of seven members, exclusive of the President, Vice-Presidents and Secretary, who shall be ex-officio members thereof, and to consist of the following gentlemen:—Messrs JAS. NOXON, C. E. CHADWICK, H. FARRINGTON, GEO. HAMILTON, B. HOPKIN, S. E. CASWELL, and R. A. JANES.

All of which is respectfully submitted.

C. E. CHADWICK,
Chairman.

The Report of the Committee on Nomination of Officers was on motion adopted, and the gentlemen named were duly elected for the ensuing year.

Mr. E. V. BODWELL said that as the adoption of the report that has just been read, appointed an Executive Committee, it would be well to give them something to do. It was very pleasing to witness the interest manifested in the Dairymen's Association, and the earnestness and intelligence displayed in its discussions, and he thought it our duty to endeavour, in every way, to extend its influence and increase its efficiency. As it would be inconsistent in the Government to make any appropriation to an Association that was not incorporated, and as we were expecting and had been promised some assistance from that source, immediate steps should be taken to have an Act of Parliament passed incorporating the Canadian Dairymen's Association. He would therefore move that the Executive Committee be instructed to take the necessary steps to have the Association incorporated. It would not be possible to effect this object at the present session of Parliament. But at the next one it could be accomplished, and the assistance, which there was encouragement to expect, would enble them more efficiently to carry out the purposes and objects of the Association.

Mr. C. E. CHADWICK had much pleasure in seconding the motion. He thought it incumbent upon the Association to take all necessary steps towards the accomplishment of the objects set forth in the resolution

that had just been read. When he looked around him on that large assembly, representing as it did, so much of the intelligence and wealth of the country, he felt it was high time to put ourselves on a footing with other organizations of a similar character, and that were receiving Government support. Were we incorporated, we would be in a position, not only to ask, but to demand from the Government that aid which was being so freely accorded to other organizations.

The motion was then put and carried

Eight o'clock having arrived, the President introduced X. A. Willard, Esq., of Little Falls, N. Y., to the Convention, to deliver the Annual Address.

(The Address of Mr. Willard will be found printed in full on page 17).

After Mr. Willard had closed his address, Mr. E. V. BODWELL came forward to move a vote of thanks. He said that after the able and eloquent address to which we had listened, it became us to make some acknowledgment of our appreciation of it. Look back but four years, and compare the ideas of that time on the subject of cheese-making with those entertained at the present, and what a contrast! He would ask those present who had listened to the lecture to look around the country, over the several districts which they represented, and see if there was not a very great change wrought of late in the facilities, operations, and intelligence brought to bear on the process of cheese manufacture. And were we not all prepared to acknowledge that, to a great extent, this vast improvement in all the departments of dairying indusury, was owing to the research and the instruction which we had received from the talented lecturer who had just taken his seat. How much interest had been excited and emulation stimulated by these conventions and those able lectures. The great improvements he has suggested are not inconsistent and hardly inconvenient. If his suggestions have the effect of producing an article of cheese worth one fourth of a cent per pound more, an enormous profit would result to the community at large. In Oxford alone say $15,000. Those who have listened to the address must feel sympathy for those who have not; they have not only lost an intellectual treat, but have lost what would have been to them a source of pecuniary profit. He would therefore move a vote of thanks to Mr Willard for his excellent scientific address.

Mr C. E. CHADWICK—I heartily endorse the sentiments expressed

by Mr Bodwell. The ideas of the learned lecturer, if put into practical use by our dairymen, cannot help but be profitable to all. There is a mine of wealth in cheese, and which only requires patient industry and intelligent skill to develop and to utilize. I have great pleasure in seconding the motion.

The meeting rose *en masse* in support of the resolution, and on their behalf the President tendered the thanks of the Convention to the lecturer for his able discourse.

The Convention then adjourned to meet again at 9 o'clock on Thursday morning.

Thursday morning, 8th February.

The Convention met pursuant to adjournment.

The President, James Noxon, Esq., in the Chair.

The Committee on order of business made the following report:

1st. Reception of reports of Committees.

2nd. The Address of L. B. Arnold, Esq., at ten o'clock.

3rd. The Discussion of Question No. 4 on printed Programme.

4th. The Rev. Wm. Landon's Address.

5th. The Discussion of Questions Nos. 5 and 6 on printed Programme.

6th. Routine Business.

On motion the report was received and adopted.

Ten o'clock having arrived, the President introduced Prof. Arnold, of Ithaca, New York, who addressed the convention on the subject of Poison Cheese. His valuable address will be found in full in this volume commencing on page 45. This lecture was illustrated with extensive and numerous diagrams which added much to its interest and to its value. Many of the members of the Association, appreciating the importance of the facts which were brought to their notice, desired to question Prof. Arnold further respecting them. Some of these questions and answers are taken from the Report of the American Dairymen's Association for 1871, and are almost identical in substance with those asked and answered before the C. D. Association at Ingersoll.

1. Does the miasma of low lands affect the milk in all cases?—In some instances it produces a poisonous effect; in all cases it has a modifying and deteriorating influence. Milk will not keep long when miasmatic vapours are present in the atmosphere.

2. For how long a time would milk be affected after the cow had partaken of impure stagnant water?—For two or three milkings; the first milking would be the most affected.

3. Does the atmosphere, when rendered impure by gases arising from decomposing animal bodies, cause taint in milk?—Yes; that was clearly demonstrated in connection with his own factory. A calf having suddenly died, he had ordered it to be removed and buried. It was negligently dropped by the fence adjoining the pasture. A few days afterwards he noticed something the matter with the milk; it showed symptoms of taint. On examination being made, he was much chagrined to find the cause of the general taint in some way or other connected with his own milk. For several days he laboured to find out the cause. Sometimes the taint would disappear for a couple of days and again re-appear. On taking a walk through the fields he accidentally came across the carcass of the calf, which he had supposed buried. He at once had the mass of decomposition disposed of, and was never troubled with taint afterwards. It was found on calculating back that on the days the milk was affected, the cows were in the field contiguous to that in which the carcass lay, and that on the days when no taint was observable, the cows had been removed to another pasture.

4. How is it that, in a factory which makes from five to ten cheese a day, one or two of these cheese may be stinking and the rest sweet; and although all the curds may be taken from the same vat?—The cause is evidently local and not general. It could not therefore be caused by fungi. The curds were probably spoiled by the salt which may affect one part of the vat more than another.

4. Does the whey, slopping over the floor of the factory, cause taint?—It certainly does. A kind of fungi germ arises from sour whey slops which under those circumstances drops into the milk and develops with astonishing rapidity. Whenever there is any sour whey on the floor of the factory or has been allowed to drip into the crevices, the cheese is more or less affected. Gases are ever endeavouring to pass into the cheese from the outside, as if seeking an equilibrium, and the cheese in all cases absorb flavour from the surrounding atmosphere.

6. Is there any other way to destroy germs in milk than by aeration?

—Yes. Agents may be used for that purpose. The sulphites are generally destructive to ferments. The Sulphite of Soda was applied to the milk examined by Prof. Law with complete effect. But it is not desirable to use chemicals in milk of which butter and cheese are to be made, however harmless they may seem to be. The best and most effectual remedy is heat.

7. What degree of heat will destroy them ?—Different germs die at different temperatures. The Arthrococcus or sour milk spores require a boiling heat and are not always killed at that, while the Micrococcus lose their vitality at 140 degrees. The ferments, detrimental in cheese-making, at least those that are notoriously so, die at heat varying from 130 to 170 degrees.

8. Does killing the ferments in milk make it as good as milk that does not contain them ?—No : the dead organisms give an altered flavour to the milk, and to the butter and cheese made from it, and hasten their decomposition.

9. Does all tainted milk con tain fungi such as those illustrated or something like them ?—Not necessarily. The kind of milk that is recognised and known as tainted milk is made so from a feverish condition in the cow, and that feverish condition may be caused by the introduction of ferments from slough holes, stagnant pools, swamps, &c., when something of the character of what has been exhibited will be carried into the circulation of the cow, and cause fever, and be present in the milk. But milk becomes feverish and induces taint by worrying the cows in any way, as by driving with dogs, the annoyance of flies, too much exposure to hot sunshine, &c., &c., when such organisms as exhibited do not appear.

10. Will airing milk destroy all the germs in it ?—No. The spores or seeds of fungi in milk seem not to be destroyed by contact with the air, but after germinating, the growing plants are killed by exposure to the air.

11. How can you distinguish between micrococcus cells and milk globules when both are in the milk ?—By their external appeaarance. The cream globules are unequal in size, larger and more rotund in form. The micrococcus are minute and a little flattened.

12. In the case of milk examined by Prof. Law, do you know whether all the cows in the dairy gave such milk or only one; and was there any appearance of disease in the cow or or cows producing it ?—The cows did not all give such milk, but I did not learn how many were affected. There was no appearance of disease other than what was detected by the thermometer.

[Note from Mr. Arnold.—Since the Convention I have learned by a statement from Prof. Law, that several cows were affected but not all at once; two or three at a time; and that the milk was discovered to be faulty by the dairyman, and was taken to the Professor for examination, and was not put on sale; and that the water issued from a spring in a mossy bank, and was collected into a wooden gutter and was discharged into a wooden trough. It did not appear to be bad.—L. B. A.

13. Does all water contain living germs, and how are we to know what water is safe to use and what is not?—All stagnant water contains organisms, either animal or vegetable, that make it unfit to use, or to allow cows to drink. Though there are often found in spring water certain kinds of germs, there is seldom found anything hurtful in cool spring or rock water, or in water that keeps in motion.

14. If germs can be carried in water, through the body of a cow into her milk, and retain their vitality, can they not be introduced into the body of the cow through other means, and be in like manner carried into her milk?—I have already shown that they reach the milk by feeding cows distiller's slops. The yeast plant peculiar to brewer's yeast has been found growing in milk from cows fed with brewer's slops. The acidifying germs in sour whey, when fed to milch cows, retain their vitality in the milk of such cows, causing it to sour prematurely. Mow-burnt hay, or hay that has been heated in the mow, produces the same result. There are plenty of authenticated cases in which they have been carried into the milk through the lungs by the cows breathing foul air,

It is notorious that tainted milk has a *cowey* smell, or a smell like the stall, especially when it is confined in a tight can or warmed up to blood heat or nearly. Now if the fungi shown or something like them, are the cause of tainted milk, why does the milk have this *cowey* smell instead the odour produced by the fungi? In other words, why does not milk smell like the cause of the taint, instead of having, as it usually does, a very strong *animal* odour.

This *cowey* or *animal* odour, as it is called, is an *effect* rather than a cause of tainted milk, and its intensity may generally be taken as the measure of the disturbing cause. This kind of odour which always, to some extent, belongs to milk, is the greatest when the temperature of the cow is at fever heat. If a cow drinks swamp water, it will become a disturbing cause of health and produce fever, and reproduce in the milk the smell of that water. In such a case the increasing fever produces a corresponding increase of animal odour, and it often becomes so strong as to obscure the odour from the direct cause of taint.

A cow, drinking from a stinking mud-hole, will retain the smell of the muddy water prominently in her milk, because it will be stronger than the cowey odour produced by the fever occasioned by drinking the muddy water. Animal odour is usually the leading odour developed in tainted milk, and in the whey and curd in the process of scalding, as it is termed, because it is itself a ferment that increases with marvellous rapidity under favourable circumstances, such as occur in warm milk and whey.

At the close of Prof. Arnold's address, C. E. CHADWICK, Esq., arose to move a vote of thanks. He had listened with the deepest interest and pleasure to the eloquent and scientific address. He was also highly gratified to hear the sentiment expressed in regard to the fraternal feeling existing between the Dairymen of the United States and those of Canada. The very interesting and elaborate illustrations of diseased milk, to a reasonable knowledge of which we had hitherto been strangers, presented to us as they have been in a striking manner, by the use of diagrams, could not fail to start new ideas and to impress wholesome truths and lead to important practical results. He hoped the minds of the audience would be well filled by those fungi of which Mr. Arnold had spoken, and that they would develop, not diseased and unhealthy conceptions, but vigorous, and healthy, and profitable thought. He would move a vote of thanks to Mr. Arnold for his able lecture.

Mr GEORGE HAMILTON, in a few appropriate remarks seconded the resolution.

The next question taken up for discussion was as follows :—

4. Food for Dairy Stock—To what extent has soiling been practised, and the best system of Winter Feeding ?

Mr. H. FARRINGTON, of Norwich, read a prepared paper on the subject, of which the following is a synopsis :

WHAT I KNOW OF SOWED CORN.

1st. It will grow when and where other corn will grow.

2nd. It will grow in dry weather, when grass will not.

3rd. It is a good and nutritious feed and makes excellent milk. Cows eat it greedily. I once fed a yoke of oxen on sowed corn for six or eight weeks, without any other feed. Though they worked daily, they held their condition fully.

4th. Corn should be sown for early feeding as early as it will be safe from frosts, say from the 15th of May, at intervals of two weeks, to the 15th or 25th of June.

5th. It should be sown in drills, where the ground is likely to be weedy, that the weeds may be kept down with the cultivator and then stirred, to admit air and moisture. On sod land that is not likely to be weedy, it may be sown broad-cast, if preferred, on account of expediting the work.

6th. The rows should be north and south, when convenient, that the light and heat of the sun may be more readily admitted.

7th. It should not be sown too thick as it will then shade itself, retard its growth, turn pale, and lack richness. The probability is that the stalk of corn, as of other grain , contains the most nourishment just at the time the ears begin to form and the berry begins to fill. Hence it should not be sown so thick as entirely to prevent the ears from beginning to form. The rows should be from 28 to 32 inches apart.

8th. Neither should it be sown too thin as it will, under those circumstances, be likely to grow too large and coarse, and be less relished by the cows. Probably, from one and a half to two and a half bushels per acre, will be about the proper quantity : say from two to two and a half bushels on strong land, and less on a weak soil, as this latter cannot mature as many stalks as strong land.

9th. It is, perhaps, not best to sow the large Western corn on very rich land, nor the small eight-rowed on poor land. If but one kind be sown, probably the Northern twelve-rowed would be the best.

10th. As a rule it should not be cut till the blossom appears, and will not suffer by standing two or three weeks longer, if needed for soiling. If not wanted for this purpose, it may be cut and stooked up for early winter use. If put up into moderately large stooks, it will keep better than in the barn, and will not mould as it is apt to do in the mow. If the stooks are small, too much of the corn becomes weather beaten. If properly attended to, it may stand in the field until early winter without injury, when it is very good feed to go into winter with.

11th. It may be cut with the corn cutter, or with a scythe or with the mowing machine.

12th. From long experience, I am convinced that no dairyman should be without an acre to every ten in corn. The cow being a machine for manufacturing milk, she must have the raw material in good condition, or she will be useless in the proportion that she lacks it. A member sug-

gested a plan which he had adopted on a small scale last season, viz.: that of planting potatoes and corn in alternate rows. He thought the idea would be found to work well, if generally adopted.

Mr. BALLANTYNE—In our section of country, we felt the importance of soiling last year more than ever before. This was owing to the frequent frosts which almost entirely destroyed the corn. On this account the patrons suffered fearfully. I induced one of my patrons to try corn five years ago. I have imported annually a supply of the western variety, and would recommend sowing it broad-cast; if planted in drills, then 30 inches to 3 feet apart. No land is better adapted to growing corn than sod, if sown broad-cast. The importance of a supply of corn, when the pastures fail, can hardly be over-estimated.

QUESTION BY DELEGATE.—What is the comparative value of corn and clover for feeding purposes?

Mr. BALLANTYNE—Red clover is not regarded as a choice article of food; the superiority of corn is generally admitted.

The meeting then adjourned till 1., P, M.

AFTERNOON SESSION.

After recess the following subject was taken up:

5. Has the quality of our cheese, during the past year, met the requirements of the foreign market, if not, in what has it been deficient, and what steps are necessary to take to remedy those deficiencies.

Mr. JOHN CRAIG, of Woodstock, thought that this question had been very fully answered last night by Mr. Willard in his lecture, when referring to the relative prices of Cheddar cheese and that made in Canada and the United States. Our cheese have not been altogether such as the English market demands, inasmuch as the Cheddar cheese maintained its price at 80 *shillings*, while American brands were selling at from 48 to 60.

The cause of this deterioration is involved, to some extent, in the question which comes before us to day. He would only give his experience in the matter, the experience of others has probably been different. His experience of cheese and of the cheese trade was extended over many years, both in Canada and in one of the largest cities in Great Britain. The May cheese shipped by him had, without a single exception, given dissatisfaction in London, in Liverpool, and in Glasgow. The letters he had received from persons to whom he had shipped, stated that New York made cheese

was better than ours, at that time. This was probably owing to the pastures there being earlier than with us. Much of our early cheese is fodder-made, and as such cannot compete with that made from grass. Cheese sent by him to Great Britain, after the month of May, gave universal satisfaction. He was very careful, however, in his selection, and exported nothing but the sweetest flavoured cheese. He had no doubt but that more depended upon the proper curing of the cheese, in regard to producing a good article, than perhaps on anything else. Mr. Willard had already directed their attention to this important matter, and had impressed upon them the necessity of having properly constructed curing houses, and of studying carefully the best methods of curing. It is not every improvised shanty on the farm that is adapted for a curing house. Cheese is a most sensitive subject, and is always ready to absorb any deleterious effluvia by which it may be surrounded. Those engaged in its manufacture should see that all necessary requisites to produce a good article were present, and that all non-essential ingredients and baneful influences were absent. Strong and pungent cheese may be desired by that class who only use it as a dessert, perhaps to give zest to their wine. But the cheese for the working classes—that cheese that folk like to take a good "whang" of, and consume largely, must be sweet and compact, and mild flavoured. And when cheese comes to be consumed as an article of diet, by the middle and lower classes; when they come to regard it as one of the chief and best sources of bone, and muscle, and sinew; when it becomes a staple article of food in our great centres of industry, then there will arise a demand for it that may well be said to be limitless and exhaustless. He had frequently heard it said that, in regard to agriculture, any fool who could "holler" "Ha Bess and gee Jane" was amply qualified for a farmer. But from the lectures that have been delivered and from the discussions that have arisen, it becomes manifest how great the amount of science was requisite in one branch of agriculture alone. Dairying is a business that demands the highest stretch of the intellectual faculties. He had no doubt but that the manufacture of Canadian cheese was yet in its infancy. The enthusiasm manifested at this Convention was an earnest of future success. A grand career of improvement and progress lies before us. Soon we shall be able to command a ready market for our dairy products, wherever they may be sent.

Mr. CASWELL—I feel pleased with the strain in which Mr. Craig has just spoken, though I arrived too late to hear the whole of his remarks. My experience is, however, somewhat different from his. May cheese if

properly made and sent to market early, will generally command a fair price. It is very seldom made with proper care. It has so happened during the past season that those who shipped late secured the best price for their goods, but it would not be safe to calculate on a similar result in future. In regard to curing houses, there are very great deficiencies to be found in them throughout the country, and very great ignorance in respect to the exact temperature, &c., required to cure cheese properly. Sometimes the cheese would be almost roasting with heat, at others almost freezing with cold. Many factories have little or no ventilation; they have single floors with many a chink and sometimes not a thermometer. The temperature of the curing houses should be kept uniform, and a stove is always a necessary auxiliary in the fall of the year. It would be well for all engaged in cheese-making to pay a visit to Mr. Harris' factory, near Ingersoll, and observe his method of heating and ventilation. I fully concur with what has been said in regard to the consumption of cheese by the middle classes. There certainly would be a never failing market at home and abroad, if that consumption should become general and permanent. I also agree with the statements in respect to early shipments, and in respect to the increased demand caused by early sales.

Mr. CRAIG—I would like to impress upon all present the necessity of trying to raise the character of our productions. We, as buyers, are often found fault with, for refusing to take the bad cheese with the good. Very often it occurs, that a few bad cheese diminish the price of an entire batch of three or four hundred, and the character of the factory is also thereby injured.

Mr. D. PHELAN, of Ingersoll, thought that the chief source of bad cheese was to be found in the unskilfulness of the factory hands. It would be a good plan, he thought, for the Association to secure the services of a first-class maker, whose business it should be to go round and give instruction to factory men on cheese-making, the construction of curing houses, and in other matters connected with the dairy business. There were many dairymen, he thought, who were not first-class makers, and who were chiefly instrumental in throwing upon the market, second and third-class products. If such an inspector or instructor could be employed to examine factories and curing houses, and to remedy their defects; and if he would deliver lectures occasionally to the farmers and patrons on subjects connected with the dairy, it would be a great advantage to the general community and to the dairying interests, and would ultimately raise our factory system to its highest possible state of efficiency.

Mr. ARNOLD, of Ithaca, N. Y., heartily approved of the ideas and sentiments expressed by Mr. Phelan. Such a course could not fail to be productive of beneficial results. He referred also to the benefits which had arisen from a voluntary movement, on the principle above alluded to, amongst the dairymen of the first Association formed in Herkimer County, New York.

It was then moved by Mr. JANES, seconded by Mr. CRAIG, and resolved "That the suggestion of Mr. Phelan, in regard to the appointment of a competent cheese-maker to visit the various cheese factories, be referred to the Executive Committee, for further consideration."

A MEMBER—What is the proper time after "the cows coming in," in which it would be safe and advisable to send the milk to the factory?

It was suggested by some, that it depended to some extent on the quantity and quality of food the cow had. Mr. Arnold said, that the usual time was from three to five days, but, in some cases, it was not safe to send until after the expiration of three or four weeks.

A MEMBER—What is the proper temperature at which spring cheese should be cured?

Mr. ARNOLD—May cheese, the product of hay, should be cured at about 80 degrees—a much higher temperature than that necessary to cure cheese made from grass.

On motion, the question was then laid on the table.

The sixth question was then taken up and discussed.

6. How does the experience of the past few years warrant making dairying a speciality, to the exclusion of grain raising?

Mr. FARRINGTON, JR. of Yates Co., N.Y., opened the discussion. He felt a double interest in the Canadian Dairymen's Association. First, there was the natural interest that, as a dairyman, he felt for all associations of this kind; then he had a father and two brothers identified with the dairying interests of Canada. He referred to the great progress made in the cheese manufacture during the past few years, both in Canada and the United States, and alluded to the identity of interests which bound both countries together. The line which divides us socially is purely imaginary. He heartily congratulated the Canadian Association upon the success which had attended their efforts. He then read the following address

which he had previously delivered before the American Dairymen's Association.

DAIRY FARMING IN CONNECTION WITH GRAIN RAISING.

The experience of the past season, has convinced the farmer, the grain raiser as well as the dairyman, that if he would have his receipts sufficient to cover his legitimate expenses, he must husband his resources, or in other words, he must make every hour's labour count, and every acre produce to its utmost. As a natural outgrowth of this state of things, the subject of "mixed husbandry," has forced itself upon the minds of the thinking portion of the farming community.

The danger of the farmer of relying entirely upon a single branch of industry, as is quite generally the custom throughout the oldest dairy districts, is being apprehended to a certain extent. Mr. Willard has, for several years recommended to the dairymen of Herkimer and vicinity that they raise more grain in connection with dairying than is customary. That each farmer ought, at least, to produce sufficient wheat for his family; a sufficient amount of coarse grains to feed his teams, and a liberal supply for his herd in the spring of the year, assuming, of course, that a sufficient amount of his land was adapted to raising grain. But the receipts to the dairyman for several years past having been quite satisfactory, this advice has quite generally fallen upon unheeding ears. While upon the other hand, the grain farmers of this and the Western States, not being satisfied with their receipts, and perhaps being stimulated very much by what dairymen were doing, have gone to making cheese or butter, and in many cases, both in connection.

Factories, almost without number, have been built in these sections within the past few years, and cheese-making has been rushed into in many localities to the abandonment or neglect of their accustomed business, and from not having realised the fact that their lands were not naturally as well adapted to grazing as the old dairy lands, besides too much of it having been almost continually ploughed and cropped, and the elements that should be in the soil necessary to produce a fine-flavoured and meaty cheese, having been very much exhausted, and in most cases not having provided against the exigency of a drought, which is so common in most of the grain regions, and, as might be expected, when an individual or community go into any business that they don't understand, and run it into an extreme, the result has not been as remunerative as was anticipated.

With the experience of the past before us, it seems to me that to adopt

the mean between the two extremes is the best course to pursue, to produce the most satisfactory results. For the purpose of showing what may be done by connecting both branches of industry under consideration I will first take a grain farm and show its usual receipts and profits, and then connect dairying therewith and show the result. I will take a farm of 100 acres, arable land, and will suppose it to be rich enough to produce 35 bushels of corn to the acre, 25 bushels of barley and 15 bushels of wheat, and that a rotation of crops is followed by two years of seeding. It would then contain three fields of twenty acres each, 40 acres of grass land to be divided between pasture and meadow. At present prices the product of such farm would be :

20 acres of corn, 35 bushels per acre, 75c,.....	$525
" barley, 25 " 60c,.....	300
" wheat, 15 " 12s,.....	450
And 15 head of young cattle could be kept summer and winter (besides cows sufficient to furnish milk and butter for family use) that will make an average annual gain of $15 per head.....	$ 225
And we have the total product.....	$ 1,500

At the customary rates of renting such farms, it costs one-half the products of such land to raise them, leaving proceeds with which to pay taxes, repairs, &c., $723. (The price of wool and mutton having materially advanced within a year or so, undoubtedly some more could be made by substituting a part or all the young stock with sheep. But from this not being the general custom among grain farmers, I have left them out of the calculation.)

We will now suppose the same farm be devoted to grain and dairying in connection. We will divide the farm into three 18 acre fields, for corn, barley, and wheat, respectively, and 6 acresfor soiling crops, roots, etc., and 40 acres for pasture, upon which we will keep 20 cows, which should make 400 lbs. of cheese each, at 10c. per lb., after deducting cost.

Of manufacturing, etc., ...	$ 800 00
20 lbs. of butter to each cow, at 25c..	100 00
20 " " pork " " " " 6c.,.....	24 00
20 calf skins, " $1.,.....	20 00
19 acres of corn at 35 bush. to the acre, at $1 50c.,	236 25
18 acres of barley at 25 bush. to the acre, at 60c.,	270 00
18 acres of wheat at 15 bush. to the acre, at 12s.,	405 00
Total receipts,.....	$ 1,855 25

It costs on a dairy farm for two-fifths of the cheese and butter $360, and one-half of the grain and pork $477 62. Deduct depreciation of stock $100, making whole expense $937 62. Net proceeds, ... 918 63

Leaving a balance in favour of grain and dairying, of $193. You will see that I have given the grain and dairy farm credit for but 9 acres of corn sold. Neither has there been any meadow allowed, as I have calculated that the nine acres of corn, with the fodder from 18 acres, and the barley and wheat straw from 36 acres, would be abundantly sufficient, without any hay, to winter all the cows and necessary teams, which a moment's reflection will satisfy any thinking person is correct, without giving the value of the different grains and fodder in figures, which I have dispensed with as much as possible. I will now take a dairy farm of the same size and value, and show its products as ordinarily conducted. Such a farm will keep 30 cows (and the necessary teams) that will produce

400 lbs. of cheese	each, 10c.		$1,200 00
20 " butter	" 25c.		150 00
20 " pork	" 6c.		36 00
30 calf skins	" $1		30 00
Total products			$1,410 00
For expenses 2-5 cheese and butter		$540 00	
For expenses, ½ pork and skins		33 00	
Depreciation on stock		150 00	
Total expenses		$723 00	
Net profits			$693 00

Some years since, Hon. Geo. Geddes, at one of the State fair discussions of this State, was credited with saying that more stock was kept upon grain farms than upon dairy farms. Whether or not this is entirely correct as a general principle, I have not the statistics to show. But the statement certainly comes from high authority, and is sufficient to show that a much larger amount of grain may be produced on dairy land than is now common.

I will now connect upon the same farm grain-raising with dairying, which will keep 30 cows. Allow me to say right here that a farm of the same value per acre in the dairy districts, from its more natural adaptation to grass, will keep more stock upon the same number of acres, if fed upon grass and hay mainly, than can be kept in the same manner upon a farm.

in the grain districts. We will suppose that 40 acres for pasture, 5 acres to soiling and 55 acres to the meadow and grain. We will select fields from the whole farm to plough that one best adapted to tillage and grain, or such as may require reseeding. But a small proportion of the dairy lands are naturally as well adapted to grain-raising as the grain farms of the same value; but in a farm of this value we will suppose that there is enough from the whole farm to furnish thirty acres of good, productive grain land every year and arranging it so that none of the land should be in grain more than three years in succession and into grass less than two years in succession. Then we will have 15 acres of meadow, and 30 acres of corn, oats and wheat—either winter or spring wheat, as the land or circumstances may require—and we have for

10 acres of wheat at 15 bushels per acre,			$1 50c.,	$225 00
5 " " corn " 35 " " "			75c.,	131 25
5 " " oats " 50 " " "			50c.,	125 00
30 cows 400 lbs.	cheese each		10c.,	1,200 00
20 "	butter "		25c.,	150 00
25 "	pork "		75c..	45 00
30 "	calf skins		$1....	30 00
Total product				$1,906 25
For expenses 2-5 cheese and butter,			$675 00	
Grain, pork, &c			278 13	
Depreciation on stock			100 00	
Total expenses			$1,053 13	
Net profit				$853 12

The 15 acres of meadow is supposed to produce 22½ tons of hay; 10 acres of corn fodder, equivalent to ten tons of hay, leaving necessary to winter the 30 cows (estimating two tons to the cow) 28½ tons of hay or its equivalent. The ten acres of corn and oats not credited to the farm as sold will furnish at the yield given 18⅓ tons of meal, which, with the oats and wheat straw from 20 acres, you will readily see is much more than equivalent to the 28½ tons of hay lacking, and is abundantly sufficient to winter the herd and the necessary teams. Thus I show a balance in favour of sowing grain in connection with dairying over that of dairying alone of $160. In these estimates I have supposed that the farms were rented, which, if conducted by the owner, would increase his net receipts, as no tenant is expected to work for just day wages. In addition to this balance from a mixed husbandry, there is another of vital importance, which is far too little thought about, viz: the converting so much of the grain and fod-

der into cheese and butter, and thereby drawing upon his soil lightly. While the grain farmer, in disposing of his grain or converting it into beef and selling it off the farm, is constantly drawing heavily upon his land, and while the dairy farm may and should be improving in fertility, the grain farm must naturally be diminishing in productiveness, and I believe the facts will substantiate the statement.

Thus far I have given the course usually adopted by farmers generally, while I am well satisfied the profits might be very much enlarged if a judicious system of soiling and high feeding were to be adopted.

A number of years since, A. L. Fish, Esq., of Herkimer, desiring to ascertain the result of high feeding, reduced his herd from 60 to 30 cows, and in addition to giving them the same range that the 60 herd formerly had, fed them liberally with shorts and whey all the season, and the result was 847 lbs. cheese to the cow, while he had formerly produced from the 60 cows 400 lbs. to the cow. He told me that for five years in succession his herd averaged over 700 lbs. to the cow.

Another very important matter to insure successful dairying, especially in the grain districts, is that of soiling. A large portion of our country is subject to a drought of longer or shorter duration, nearly every season, and hence a part of the season there is no reliance to be placed upon ordinary pastures, and some soiling crop becomes all important, if for no other reason than to supply this deficiency.

But this brings to my mind another thought, which is this. We, as farmers, have been, and are too much of the opinion that nothing save the ordinary pasture and meadow is profitable. But I suppose no one doubts that an acre of land equally well adapted to grain or grass, will afford very much more feed than if devoted to grass. To illustrate, suppose one acre will afford one and one-half tons of hay, and the usual allowance will keep a cow 150 days, and if in pasture will keep a cow 90 days. Now we will suppose it be planted in corn, and that yields 35 bushels, and the equivalent in fodder of one ton of hay, which is only an average yield for good land. It is laid down that 2 lbs. of corn meal is equivalent in nutriment to 5 lbs. of the best hay, and 35 bushels of corn will make one ton of meal, which will be equivalent to fodder and meal, to $3\frac{1}{4}$ tons of hay, which would keep the cow 350 days. But it may be said that after deducting the cost of extra labour over that of producing the hay we have not made anything. Let us see: Suppose it costs $3 to cut and secure the $1\frac{1}{2}$ tons of hay. Now suppose it costs $12 to raise and secure the acre of corn, and assuming that the interest on the land in each case is $7, and we have the cost of the

hay, 1½ tons, $10, against the corn and fodder (which is equivalent to 3¼ tons of hay,) at $19; costing 5½ cents per day to keep the cow, against 7 cents per day if kept on hay. From the experience of several farmers, with whom I am acquainted, it has been ascertained that four pounds of wheat bran per day, with what straw a cow will eat, will keep her equally as well as 21 pounds of hay per day. If more grain, soiling crops, roots, &c., were raised and fed upon our farms, (instead of hay), of course a much larger amount of stock could be kept and the more stock the more manure there is made, and the more manure the more productive will be the land. And not only so, but unquestionably the stock would be much healthier than is usually kept, and as 20 tons of mangolds may be produced from an acre, and as has been ascertained from analysis and experience, four pounds are equal to one pound of the best hay, it shows that it will pay the dairyman well to raise them.

I believe the chief reasons why the English farmer is able to produce so much more from his land than is usual with us, to be from the fact that he raises and feeds more roots in connection with rich, concentrated food, with hay or straw, to get the bulk, and consequently manure very heavily. In the oldest dairy districts, undoubtedly, the yield of grass and hay many times might be very much increased, if the land was ploughed oftener and reseeded. Soil is frequently very much benefitted by simply ploughing, thereby loosening and dissolving it. If soiling was more generally adopted by dairymen, the amount of stock kept might be very much increased. Mr. Fish, in experimenting as to the value of soiling, produced from an acre of land, 36,000 pounds of corn fodder (green). He put one cow in the stable, and fed her exclusively on the corn, and she ate 100 pounds per day; and the acre, at this rate, would keep her 360 days. This cow, while eating the corn fodder, gave 30 pounds of milk per day. Take the average of dairy lands, and four acres are required for the summer and winter keep of one cow; while those who practice soiling tell us that by that method one acre is sufficient.

Another saving to the dairyman might be made by cooking the food for his stock during the winter. Hon. W. I. Skinner, of Herkimer, cooked the food for his herd of 40, and found that after deducting cost of extra labour, interest on money invested in cooking apparatus, &c., found that he had made a saving of 25 per cent. over the usual method.

In the examination of this subject I have avoided giving the value in nutriment of the different grains, hay, roots, &c., in figures as laid down by scientific men, deeming the experience and observation of practical men

sufficient. I have taken this opportunity to throw out a few suggestions in relation to subjects which, as farmers of to-day, when lands, labour and taxes are so high, we need to investigate. The farmer should bring his brain into action as well as his muscle. He should not cling with such tenacity to his accustomed habits because his father or grandfather did thus and so. But he should break away from antiquated opinions, notions and habits, and launch forth upon the vast and unexplored regions of thought and action.

On motion, the sixth question was laid on the table.

On motion, the First Order of Business was again taken up, for the purpose of allowing the Finance Committee to present their report.

The Finance Committee of the Canadian Dairymen's Association beg to report :—

1st. That they have carefully examined the Treasurer's Books and find the receipts and expenditures as follows :

RECEIPTS.

To Balance on hand as per Report of last year	$128 85
" Members' Tickets	324 00
" Day "	29 83
" Grants and Subscriptions to Cheese Fair	126 00
" Reports and Advertising for Government	250 00
" Advertising	40 00
" Two Reports	1 50
	$900 18

EXPENDITURE.

By Publishing Report	$250 00
" Prizes given at Cheese Fair	265 00
" Addresses last year	50 00
" Secretary's salary	25 00
" Other expenses	148 00
	$ 738 20
Balance on hand	161 98

2nd. Your Committee would recommend that, in future, the Executive Committee appoint two Auditors, whose duty it shall be to audit the

books and accounts of the Association previous to holding the Annual Convention, and sign the same as Auditors.

3rd. Your Committee would recommend the payment of the sum of fifty dollars each to X. A. Willard, Esq., and L. B. Arnold, Esq., as a token of appreciation of their excellent addresses, in the preparation of which and in travelling a long distance to deliver them here, they must have incurred considerable expense.

4th. Your Committee would further recommend the payment of one hundred dollars to the Secretary for his services during the past year.

BENJAMIN HOPKINS,
Chairman.

Ingersoll, Feb., 8th., 1872.

On motion, the Report of the Finance Committee was adopted.

The programme being now exhausted, the President stated that an opportunity would be given to consider any miscellaneous business which the Convention might think expedient to discuss.

Mr. CASWELL thought that if those who took prizes at the Fairs during last season were to describe their process of manufacture, and the materials they made use of in making, it would be highly interesting and doubtless highly profitable.

Mr. BALLANTYNE, being called upon, said—One object with which our Association is formed is, that we may compare notes with each other and get the benefit of each other's experience. We live in an age of progress, and in no branch of industry was that progress more observable than in dairying. When he commenced the dairying business, he was obliged to send all the way to Washington to obtain a cheese report. I shall be happy to answer any question that may be asked by any member as far as I am able.

In reply to questions, Mr. BALLANTYNE said—I make twice a day and never mix the morning's milk with the evening's. My patrons take care of their own cans. The milk is frequently tested. As soon as the milk is received at the factory, the agitators were set to work to expose it to the atmosphere. The morning's milk is aerated till about 11 o'clock. We cannot attach too much importance to ventilation. The tendency to taint is prevented or retarded by exposure to the atmosphere. I had only one batch of curds that had a tendency to float. However, it made a

nice solid cheese with good flavour. In regard to curing rennets, our practice is perhaps the simplest possible. We take the stomach when three or four days old, empty it of all foreign matter, cleanse it, stretch it and hang it up to dry.

Mr. H. S. Losee in reply to questions proposed by different members said—He made twice a day, except on Saturdays, and he invariably found that his Saturday night's cheese was not as close as the rest. Temperature of the milk at setting—84 degrees. Mode of cutting curds—first lengthways with perpendicular knife, then crossways, then with a horizontal knife. As soon as the cutting is finished, apply heat but very slowly. Take an hour and a-half to raise to the required temperature, or about 98 degrees. He put in sufficient rennet to cause coagulation in twenty minutes, and if he wanted the cheese to cure quickly, he added more rennet. This year he used C. P. rennets: they were very sweet and of fair strength. Last year and in 1870, they were not so good as formerly. The average number of pounds of cheese to one rennet was about 300. He cured rennets by letting the calf fast for, say, 14 hours before killing; turn the stomach inside out, but don't scrape off the coating; apply a little salt; turn back again and apply a little more salt; let it lie in dish for half-a-day, then stretch and hang up to dry. Curd should be salted when wet and just after dipping. He cut the curd in forty to fifty minutes after setting. It should never make a clean break before being cut. He used the factory-filled Liverpool salt. $2\frac{7}{10}$ths lbs of salt to the hundred of curd was his rule, If the curd should be inclined to float, add more salt. Most factories do not cool and air the curds sufficiently.

A vote of thanks was passed to the retiring President, Mr. James Noxon, and the proceedings of the Fifth Annual meeting of the Canadian Dairymen's Association terminated.

On motion, the Convention adjourned to meet again at Ingersoll, on the first Wednesday in February, 1873.

AN ADDRESS

DELIVERED BEFORE THE AMERICAN DAIRYMEN'S ASSOCIATION, AT UTICA, N. Y., ON

THURSDAY, JANUARY 11TH, 1872,

BY

PROFESSOR GEORGE C. CALDWELL,

Of Cornell University, Ithaca, N. Y.

THE PRACTICAL VALUE OF CHEMICAL ANALYSES OF THE DAIRYMAN'S RAW MATERIALS AND OF THE PRODUCTS OF HIS MANUFACTURE.

MR. PRESIDENT AND MEMBERS OF THE DAIRYMEN'S ASSOCIATION:—The subject which I have chosen for this address, was selected because of my conviction that it might be profitable for the dairyman to resort more frequently than he now does to simple analytical tests of his raw materials, for the purpose of enabling him to form a more correct judgment in regard to their value; these tests being either such as he can perform himself, or even such as may require the skill of a professional chemist for their execution. I shall, therefore, after describing the usual chemical composition of each kind of raw material, attempt to show in what way, and to what extent, its value is liable to vary, whether and how the dairyman may himself test it, or to what extent it might be advisable to get a chemist's analysis of it.

I am aware that the largest portion of my audience is made up of those who manufacture milk into butter and cheese, and

who, provided they can get good milk in sufficient quantity, care little how that milk is produced ; such persons may think that I devote too much time to the consideration of soils, manures and fodder ; but it is, to my thinking, beyond question that all of you, whether working on the dairy farm, or in the cheese or butter factory, are equally interested in whatever may serve to increase the production of milk. There is a vast army of men and women, who cannot come here every year, engaged in this production, without whose co-operation the factory system which you so largely represent would have no existence ; your success is closely connected with theirs, and if, besides the profitable wisdom that you carry home from here for your own use, you would treasure up whatever comes in your way that may be good for them, and impart it to them in liberal measure, the measure of your own success may be increased to a like extent.—Then this Dairymen's Convention might become a sort of a teachers' institute, and the sphere of its usefulness would be greatly enlarged.

GENERAL COMPOSITION OF SUBSTANCES.

All the materials which the Dairyman handles, whether raw or manufactured, are to a certain extent alike in composition. Every soil which will yield anything that can justly be called an agricultural crop, as well as almost everything that the farmer is accustomed to put on the soil, in order to increase its productive powers, every plant that he raises for food, or fodder for his animals, every animal that he feeds with the produce of his land, and every article that he manufactures, such as milk, cheese, butter, wool, wine, vinegar, with or without the aid of these domestic animals, is composed of a volatile part that can be driven off by the heat of a fire, and a non-volatile part, which remains behind and constitutes what everybody is familiar with as the ashes of what has been burned. The volatile part itself consists of water, which is expelled at a much lower temperature than that required to expel the other, or what may be called the combustible portion by burning.

You fell a tree in the forest, cut it up and let it season ; a

part of the water with which its channels and pores were filled when you cut it down escapes, even at common temperatures, as the wood dries; you put a stick of the seasoned wood on the fire, and the great heat drives out the rest of the water, while it kindles the wood itself into a blaze; the largest part of its solid structure is entirely broken up, and converted into invisible gases that pass away through the chimney, while a small, insignificant pile of ashes remains behind. You may have, as in the case of milk, a great preponderance of water, but, for all that, there will be something left to burn after the water has been driven off, as many a housewife has learned to her sorrow, when obliged by a call in another direction, to leave the milk for the pudding boiling on the stove; and after the residue left by the water has been completely burned, a careful examination will reveal the presence of the ashes in the bottom of the kettle. Orifit is a lump of dry soil you put on the fire, though there may appear to be no escape of water, and although what is left behind after a thorough heating may seem to be just as much in quantity as what was put on the fire, nevertheless a careful heating in the first place, at a low temperature, would cause a loss of weight, as could easily be proved with the aid of your kitchen scales, by reason of loss of water; and a stronger heating afterwards would cause a further loss of weight as could be proved in the same way as before, by reason of loss of what was burned out. This triple constitution you will not fail to find, if you but seek for it, in all your raw materials, and the products manufactured from them; only you may find the there kinds of matter in very different proportions, in different substances.

Now, just as we have been able to show, in part by calling to mind some fragments of your own experience, that most of the substances with which you are so familiar from constantly dealing with them in your daily operations, are composed of three different parts, or kinds of matter, so the chemist, by going further finds that both the combustible part, and the ash, are themselves composed of several different substances; the number of these, however, seems wonderfully small, in comparison with the almost

infinite variety of results produced with them. Whatever it may be that is burned, only twelve elements can be found in the ash left behind, in proportions worth noticing; these elements are combined together, and their most important compounds in the ash are potash, lime, magnesia, phosphoric and sulphuric acids, and silica.

In like manner we can find in the volatile or combustible part but six elements, which are likewise united together, forming by their combination several classes of substances that are found in the products of vegetable and animal growth; four of these classes of substances, that occur in the plant, are of special importance to us; the most convenient names for these are, fibre, soluble non-nitrogenous matters, fats and albuminoids; all of these are found in the animal also, except the one first mentioned. These four classes of substances, although requiring for their separation from one another more complicated processes than are necessary in the case of the components of the ash, and even with these more difficult processes not, after all, so sharply separable, are yet no less unmistakeably different from each other, than those. There is no more danger of a good chemist's mistaking one of these substances, whether belonging to the volatile or non-volatile part, for another, than of your mistaking a sheep for a pig, or a milk-pan for a cheese.

Now some of you, either dairymen farmers, or dairymen manufacturers, in the course of your daily practice have to deal with soils, waters, amendments or manures, fodder crops or foddering materials, and milk and its manufactured products. All these classes of materials cannot be considered at this time, as was at first intended, according to the programme laid down in the beginning of the lecture, without taxing your patience altogether too severely. I will therefore begin at once with the consideration of manures.

FERTILIZERS.

Of these the most important, by far, is barn-yard manure. But every intelligent farmer knows about what his stable manure is worth; he knows, or ought to know, how much care it is worth his while to bestow upon it in order to bring its quality up to a

high standard of excellence; and there appear to be no ordinary cases, when the judgment, which the farmer could pass on the value of his manure on the basis of his own experience, would be enough better when aided by the results of a chemical examination, to compensate for the cost of these results.

Besides the stable manure, however, he uses other fertilizers, which are sold in the market, and which he buys to make up for a deficiency in the home-made product. The most important of these is some prepared form or another of phosphate of lime, the use of which constitutes an important feature in English husbandry, in connection with the production of roots for fodder; sometimes it is nothing but finely ground bone; sometimes this bone has been treated with oil-of-vitriol in order to render the phosphoric acid more soluble, and so more easily accessible to the plant; this product is the so-called superphosphate; sometimes finely ground rock, rich in phosphoric acid, or mineral phosphate as it is frequently called, is treated in the same manner; sometimes salts of potash, or compounds containing nitrogen are added; moreover the process of manufacturing the superphosphate can be so manipulated as to bring into a soluble form more or less phosphoric acid, according to the pleasure of the maker; and as a superphosphate gets old, more or less of the phosphoric acid that was at first soluble in it passes back into an insoluble and less valuable form again. Thus it is easy to see that under the name of superphosphate, and still more under the name of phosphate, we by no means have an article of commerce that is always of the same composition, or of the same value to the consumer.

In these commercial phosphates, and fertilizers generally, the inorganic or non-volatile part predominates, and often largely. Their value depends exclusively upon the phosphoric acid, nitrogen, and potash, that they contain; that is, there is nothing else in these manures, which, considering the comparative small quantity that is put on the land, can be supposed to have any noticeable effect, or to contribute in any way to the return which the consumer expects to find in his increased crops, for this investment in additional food for them; and further, it is rare that there

is enough potash present to add essentially to the value of the article; again, of two fertilizers equally valuable with respect to the amount of plant-food which they contain, that one will be worth more which is in the form of the finer powder, or in which the lumps are softer and more easily crushed to a powder. Such are the data upon which to base the valuation of a commercial fertilizer.

The variations in these fertilizers with respect to the proportion of phosphoric acid and nitrogen are very wide; while pure bone-meal contains usually about 4 per cent. of nitrogen and 22 per cent. of phosphoric acid, there are superphosphates sold containing less than 9 per cent. of the latter, and other fertilizers not called phosphates, that contain less than 3 per cent., while at the same time there is a corresponding deficiency of nitrogen. And while a good Peruvian guano contains from 10 to 12 per cent. of nitrogen, there are fertilizers sold that contain only 0.1 per cent. Now, at a low estimate you have to pay for all the nitrogen that you buy in these manures at the rate of 25 cents a pound, and for the soluble phosphoric acid, that is for this acid in its more valuable form, 20 cents. Taking these figures into consideraton, it evidently is of considerable importance to you as a financial transaction, whether the Peruvian guano that you buy chiefly for its nitrogen, and for which you pay at the rate of sixty dollars a ton, or thereabouts, contains 200 pounds of nitrogen in the ton or only 20 pounds; in the purchase of a ton of superphosphate, bought mainly for its soluble phosphoric acid, it does make a difference to you whether, paying at the rate of at least 20 cents for every pound of this acid, the ton of 2000 pounds that costs you $50, contains 150 pounds of the acid, or $30 worth, or none at all. I am quite safe in saying that you might get no soluble phosphoric acid at all for your money, for such superphosphates have been sold in this State, and may be now; such a superphosphate may not be entirely worthless, for in the case referred to, there was considerable insoluble acid, and a little nitrogen; but the insoluble acid, according to all authorities, is worth at the most only a third or a fourth as much as the soluble; it must lie longer in

the ground before the plants can consume it all, and the capital invested in it must remain idle so much the longer.

Deception is so easily and safely practised in this matter of commercial fertilizers, that, as a rule, they are sold for considerably more than ought to be asked for them, and not seldom there are cases of outrageous swindling. Allowing very high values for the two forms of phosphoric acid, and for nitrogen, namely, 6 cents, 25 cents and 59 cents respectively, we find that all the phosphoric acid and nitrogen which could be found by the ordinary process which is applied in the chemical analysis of fertilizers, was, in one case, worth but $39 in a ton of the phosphate, while $58 was asked for it; in another case $65 was asked while the article was worth but $53; in another case, the price was $50, while the real value was but $25, and finally in another case, that of a poudrette, the price asked was $28, and the real value not over $5. In saying, as in this last case, for instance, that the real value of all the plant-food in a ton of a fertilizer was not greater than $5, it is meant, simply, that you could go into the market and buy as much phosphoric acid, both soluble and insoluble, and nitrogen, as is contained in this ton of manure, and obtain these substances in quite as valuable forms, for less than $5; or this, that it should have cost the manufacturer of that fertilizer much less than $5 a ton to prepare it, and that he would be well paid if he gave it to you at that price, or less than a fifth of what he charged for it. So far as those not in the business of manufacturing these fertilizers can judge from a careful consideration of the data to be obtained, they appear generally to be sold at a price which allows to the manufacturer a far more than reasonaable profit; and certainly sometimes, though it may not be often so, they are sold at such prices, as compared with their real value, that the transaction can rightly be called nothing else than a gross swindle.

Such overcharges and frauds are easy, in part, because there is nothing in the colour, taste, or smell, or in the appearance in any respect, of a fertilizer, to show whether it contains much or little phosphoric acid, or none at all, or much or little nitrogen. I might be met, just here, by the argument, that, as compounds

rich in nitrogen often give off bad odours, therefore, the fouler the odor given off by a fertilizer, the richer it is likely to be in nitrogen. But the fatal insufficiency in this course of reasoning consists in the fact that there are a great many bad smelling substances, and cheap ones too, that contain little or no nitrogen; and it is an easy matter, therefore, to make a fertilizer that shall have a strong disagreeable odor, and yet shall contain no nitrogen, or only a quantity so small as to add the merest trifle to its value.

The length of time which must elapse before a farmer can decide by his own experience in the field whether the use of a certain fertilizer is profitable to him, and the troublesome pains which must be taken in order to make such a decision perfectly satisfactory, are also circumstances which greatly favour the manufacturer in his practice of overcharging.

It is possible to ascertain the real value of a fertilizer in two ways, either by an actual trial of it in the field, or by a partial chemical analysis of it. Considering all the vicissitudes to which the crop is exposed, upon which the trial is made, a fair and satisfactory result may not be obtained without a repetition of the trial for two or three seasons; on the other hand, the results of the chemical analysis constitute quite as trustworthy data for estimation, or for mere comparison of values, as do the results of the field trial, if indeed they are not much more trustworthy. They show conclusively what there is in the fertilizer that has any value, and how much it is worth; and these results can be had in a few days.

It is safe to assert, then, that a profitable use can be made of the chemical examination of commercial fertilizers. I base the assertion not only upon the course of reasoning just laid down, but also upon the facts that this application of the chemist's skill has been found by experience elsewhere to be profitable. In Germany, where a greater amount of good results has been derived from the application of chemistry to agriculture than in all other countries put together, commercial fertilizers are most frequently subjected to the test of chemical examination, by competent chemists, and attempted swindles are very soon brought to light.

I venture to say that in many localities in Germany, no intelligent farmer would think of using a superphosphate without having it examined by a chemist, if not every year, yet every few years.

And what is more, while in many parts of the country such provision is made that every farmer can have a sample of a fertilizer analyzed at very low rates, there are also laws by which the manufacturer is required to label every package of his fertilizer with a statement of the percentage of soluble phosphoric acid it contains, and of nitrogen also, or of whatever else of value he may claim that there is in it; and redress is provided for, in case any sample, taken by a farmer to a competent chemist, shall be found poorer in quality than was guaranteed on the label. Maine, famous the world over for at least one of her laws, for who has not heard of the "the Maine liquor law," has a law similar in purport to the above, in regard to the commercial fertilizers offered for sale within her bounds. Connecticut has such a law, and there ought, by all means, to be one in this great State.

But even without any such law farmers could do something, especially by concert of action, for their own protection. It might not be profitable for a single farmer, using only a ton or two of commercial manures each year, to have samples of such as are offered for sale in his neighbourhood examined frequently, in order to determine, not only which, if any, are comparatively worthless but also which one is the best. But if there should be a dozen or two, or more such farmers, who, all together, would invest from $600 to $3,000 in a good fertilizer, if they were sure of getting one that would give them a reasonable return for their investment, it surely would be worth their while to expend the half of one per cent. or less for a chemical examination of what they intend to purchase at so much cost, and at no slight risk, provided they depend only on manufacturer's guarantee and recommendation for guidance in deciding upon the comparative merits of the different brands of manure. The analysis of half a dozen samples could be made to answer just as well for a score of farmers as for one; and when so many could unite together in paying for the work, the chemist might be well remunerated, while each farmer's share of the cost

would be a mere trifle, in comparison with the advantage gained; for of three or four fertilizers offered for sale in a neighbourhood one may be worth two, three or four times as much as another, while the same price is asked for all; the chemical analysis will show beyond a doubt which one that is.

Supposing that this idea is to be carried into execution by twenty or thirty farmers, or by some farmers' club, it is of the first importance that the sample selected should be a fair representation of that which is offered for sale; the best that the chemist can do is to give a true and faithful report of the analysis of what is sent to him. To this end, your representative, who is to make up the samples and dispatch them to the chemist, should go himself to the dealer, and take each sample from one of the packages of the fertilizer; for greater surety, it would not be amiss to take a little from each of several packages of the same kind of fertilizer; thus he might obtain six or eight pounds of each kind, out of which quantity, after mixing it thoroughly together, he would take from half a pound to a pound for analysis; this should be put in a stout paper bag, and this package again in another, and the label attached. All the samples should then be packed in a small box, and dispatched at once. Usually, all to be required in return will be the percentage of soluble and insoluble phosphoric acid, if the article is claimed to be a superphosphate, although it may be well to have the nitrogen determined also; but no account should be taken of the potash, unless it is specially claimed by the maker of the fertilizer that its value is due, to a considerable extent, to that substance.

When your return comes back, multiply each percentage by twenty, and you have the number of pounds of each of the valuable constituents of each fertilizer in a ton of it; then, taking the highest value per pound for these, that has been allowed by any good authority in this country, namely, those fixed by Mr. Goodale, Secretary of the Maine Board of Agriculture, and recognized in the statute of that State regulating the sale of commercial manures, values that are certainly high enough, and multiplying the number of pounds of insoluble acid by six, the num-

ber of pounds of soluble acid by twenty-five, of nitrogen by twenty-nine, and of potash by six, and adding all these products together, you will get a fair estimate, in cents, of the value of a ton of the manure. This calculated value will not be likely in any case to come up to the price asked, even though estimated on so liberal a basis; but your best policy will of course be to buy that fertilizer whose calculated value approaches nearest to the selling price.

The cost of the analysis will depend upon the number of substances determined in each sample. The ordinary charges for each substance, such as insoluble phosphoric acid, soluble acid and nitrogen would be from $10 to $15.

FODDER.

The kind of raw material that naturally comes next for consideration, with respect to the practical value of its chemical analysis, is the fodder which, with the aid of a good soil, judiciously cultivated and supplied with plant-food, the dairyman produces for the support of his cows. This, although produced from a soil in which the non-volatile part very largely predominates over everything else, and with the aid of manures in which the non-volatile matters also often greatly exceed the volatile in quantity, is itself in all cases composed mostly of volatile and combustible matter, and it owes its value as fodder almost exclusively to this. The material with which to make all this combustible substance has been derived by this plant largely from the air.

This combustible substance is composed, mainly, of four classes of substances, fibre, or insoluble non-nitrogenous substances, starch, sugar, &c., or soluble non-nitrogenous substances, fat, and albuminoids, or nitrogenous substances, this last class being particularly distinguished from the four others in that it contains nitrogen, while they do not.

These different substances have different nutritive functions and values, The albuminoids are the most valuable, in part because the most costly; every pound of albuminoids which the farmer stores in his barn in the fodder that he has harvested, has cost him more than the pound of starch, sugar or fibre; these al-

buminoids are the most valuable, also, because they have certain important nutritive functions to perform, for which no other class of substances can answer. The fat, starch and sugar are more valuable than the fibre, in part because a much smaller expenditure of the vital forces of the animal is required to assimilate them, and convert them into a part of its own substance.

Carefully conducted experiments have shown that in order to get the most profitable results from the use of fodder, there should be, firstly, a certain amount of dry substance given to the animal; that is, supposing all the fodder supplied each day to be thoroughly dried, by exposure for a considerable time to the temperature at which water boils, the weight of this dried product should bear a certain proportion to the weight of the animal. Further, in this weight of dried fodder there should be a certain relation between the respective amounts, first, of the albuminoids or nitrogenous substances, second, the fat, and third, the soluble non-nitrogenous substances. It has also been determined that the relative proportions of these three substances should vary according to the purpose for which the animal is used, whether for draft, for milk or for fattening.

For instance, it appears to result from these experiments that for 1,000 pounds of live weight, a milch cow can daily use up profitably from 22 to 30 pounds of dry substance, and which should not contain less than 2·5 pounds of nitrogenous substances, nor more than 3·1 pounds; and it should contain also, from 0·8 to 1 pound of fat, and 12 to 15 pounds of soluble non-nitrogenous substances, the remainder of the dry substance consisting mainly of fibre, and non-volatile matters. It appears, further, on comparing the proportion between the nitrogenous substance and the sum of the soluble non-nitrogenous substances, and two and a half times the amount of fat, that there is a certain relation between these quantities which is most advantageous; it is that of 1 to from 5 to 6.

The reason for all this is, that while a supply of all these substances is essential to the health of the animal, and while some one of them can perhaps perform the function of another in the animal economy, provided the one is supplied in superabundance

and the other is deficient in quantity, yet each class of substances is utilized to the best advantage, and most profitably, when required to perform only certain functions that properly belong to it. For instance, the costly albuminoids have certain important functions to perform, and, while nothing can take their place, they can serve the same purpose as the starch and sugar do, and they will be consumed in doing the work of the cheaper materials, if called upon to do so by reason of an insufficient supply thereof. If, by an injudicious system of feeding, you give your cows two pounds of nitrogenous substances with every six of non-nitrogenous, only about one pound of the former would be utilized by the animal for the proper purpose, while the other pound would go to make up for the deficiency of non-nitrogenous nutritive matters, and your system of feeding would not be an economical one, because you could have supplied another six pounds of non-nitrogenous materials, at less than the cost of one pound of albuminoids that was thus wastefully used for an unsuitable purpose. Again, supposing that for every pound of nitrogenous matter in the dried fodder of each animal there are ten pounds of non-nitrogenous; there are two or three pounds more of the latter than can be utilized, with the amount of nitrogenous material supplied at the same time; this excess cannot be converted into albuminoids; such a transformation is utterly out of the question. What can be done with it by the animal? She can use a part of it to make fat, but a part will be apt to pass off, unused at all in the excrements. What goes into fat on the animal's carcass is, to be sure, not a total loss; but you are feeding the animal for the production of milk and not for the butcher; and, in that case, a system of feeding which results in less milk and more fat, is not so economical as one which, while it keeps the cow in a good condition, gets the largest possible yield of good milk for the cost of keeping it. The non-nitrogenous matter that goes into the manure, although it may go back on the land again, is yet as good as a total loss; it adds but a mere trifle to the value of the manure, for it contains neither of the three substances, phosphoric acid, potash or nitrogen, that render a manure

valuable. Therefore, in this system of feeding, you have, with some trouble and expense, produced a certain quantity of foddering material, and stored it up in your barn, only to give your animals the trouble of carrying it through their digestive organs and into the manure pile; and after all this trouble it is not worth carrying back to the field again; such a system is certainly not economical.

To make the most of your foddering material then, you must acquaint yourself with its chemical composition, and use a certain amount of care, so as to make up a daily ration in which there is the right proportion of straw, with its abundance of dry substance to give a suitable bulk to the food, of hay with its large proportion of dry substance also, and of non-nitrogenous nutritive substances, of grain, rich in nitrogenous matters, of roots, rich in sugar and starch, and of oil-cake rich in albuminoids and fat. With a ration thus carefully made up with a due regard to its chemical composition and the special needs of the animal, all the different kinds of foddering substances do the work in the animal economy for which they are best fitted, respectively, and nothing is wasted. All good stock feeders, without doubt, do this to a certain extent; but unless they have at least an approximately correct knowledge of the composition of the various materials with which they make up the ration, they must work somewhat blindly, and as is the case with all guess work, are liable to fail widely of the mark.

But in order to acomplish all this, it is by no means necessary to send samples of all your stock of fodder to the chemist every year, for analyses of it. The chemical composition of each of the various kinds of fodder produced on the farm is about the same, when grown under ordinary circumstances. Well-cured clover hay always has about the same composition, if the growing crop is treated in about the usual way; so of meadow hay, turnips, oats, corn, etc. All of these articles of fodder have been carefully analysed, and the results recorded. In Prof. Johnson's "How Crops Grow" there is a very complete and valuable series of tables, showing the ordinary chemical composition of the materials which the farmer handles in the course of his operations, in-

cluding all articles of fodder. In Germany, where this idea of the advantage to be derived from a more careful consideration of the chemical composition of the rations of the stock, seems to have been received with considerable favour by the agricultural community, little books are published, giving not only the composition of every article that can be used for fodder, but a number of tables so arranged, that at a glance, and with but little or no calculation, one can ascertain how much non-nitrogenous matter, or fat, or albuminoids, or dry substance, there is in any given number of pounds of any kind of fodder; with the aid of such tables it is easy to make up a ration out of the greatest variety of materials, that shall have any desired composition with respect to the relative amounts of the different classes of nutritive substances contained in it.

But even with these tables to consult, there may sometimes be occasion to have special chemical analyses made; the composition of any one kind of fodder, though usually about the same, nevertheless varies somewhat with the season, soil, and mode of culture; and in case one should have a large supply of some one kind, but yet should have to buy something in order to carry the stock through till spring, a comparatively small difference in the chemical composition of this large supply might make a considerable difference in what it would be necessary to add to it, in order to make up the kind of ration which could be most profitably fed. Or even if nothing need be added to the stock of the fodder in store, yet, knowing more accurately the composition of some one kind which makes up a large proportion of it, the other smaller portion might be more economically used.

Suppose it to be a root crop, of which you have this large supply. There might be, in case the crop has received a good liberal culture on a good soil, an unusually large proportion of nitrogenous matter. You suspect this, knowing that with your treatment of the crop its quality is improved; and, if your suspicion is correct, you may have several hundred pounds more of costly and valuable albuminoids, than would be indicated if you estimated it by the tables. There is nothing in the appearance of

the root to show this, and no one can test the matter except an experienced chemist; if, by sending a sample for analysis, you have your expectation fully confirmed, you may save much more than the analysis would cost by buying, instead of fodder rich in nitrogenous matter, much cheaper articles that are rich in non-nitrogenous substances, and at the end of the year your animals will be in just as good a condition as if kept on a richer and more expensive fodder.

Let me illustrate these principles by an example, taken from a prize essay on stock feeding by Kuhn, director of the agricultural school, Halle, in Germany, an essay so well received by the German public as to have passed through three or four editions. As the example is taken only for illustration, I have not considered it necessary to give our current values, instead of the German prices in thalers, for the various articles of fodder mentioned; the thaler is worth about 75 cents.

It is supposed that fifty cows whose average live weight is about 950 pounds, are to be kept over winter, and to be stall-fed for the space of 200 days. The first step taken is to ascertain how far the stock of fodder in store will meet the demand. We have enough meadow-hay so that we can give each cow 400 cwt,; we have also 400 cwt. of good clover hay for each cow, of barley straw 100 cwt., of wheat straw 500, and of rye straw 1,200 cwt.; but having enough of these coarse materials without the rye straw, we will use that for litter. Of chaff, mostly wheat, we have enough for 400 lbs. for each cow, and of roots 5,000 cwt. We have also 2,500 bushels of potatoes; the price they will bring in the market is low, and it must be carefully considered, whether it will be more profitable to sell them, than to feed to the stock.

As to the quality of our foddering materials, three-fourths of the meadow hay were stored in an excellent condition, while the remaining one-fourth was somewhat injured. The clover grew on a strong rich soil, and was moreover manured with wood ashes; it was cut just as it was beginning to bloom, and stored in the best condition; we feel justified in expecting it to contain a large proportion of nitrogenous substance; consulting the tables we

find that this proportion may vary between 7·2 and 14·8 per cent.; we think our clover is almost as good as the best, and that we shall be safe in assuming that it contains 14 per cent. of albuminoids; for the same reason we allow for it 3.5 per cent. of fat and 38 per cent. of soluble non-nitrogenous matters. As to the good meadow hay there is no reason to suppose that it is any better than usual, and we take the average composition as given in the tables; upon the injured one-fourth we must set a lower value, and allow that it contains only eight per cent. of nitrogenous substances, and fat and non-nitrogenous substances, in corresponding proportions. The straw and chaff are of about the usual quality. As to the roots, finally, they are of a good size but not over-grown, they were well manured and cultivated, and the season was propitious; as the supply in hand is very large, and we think there is good reason to suppose that the crop is unusually rich in nutritive matters, it seems best to have positive knowledge in regard to the matter; we send a sample to the chemist, and his report of the analysis shows that the roots contain 1·5 per cent, of nitrogenous matters, instead of only 1·1 per cent. as usual, 0·35 per cent. of fat instead of 0·1 per cent. and 10·4 instead of 9 per cent. of soluble non-nitrogenous substances.

Now, with this certain knowledge in regard to the composition of one of our most important articles of fodder, we can go to work more satisfactorily to ascertain what sort of a ration we can make up for our cows, out of the supply of strictly foddering materials in hand.

The following table shows the composition of the ration:

	Dry subst.	Nitrog. subst.	Fat.	Non-nitrog subst.
4 lbs. Clover Hay.....	3·33	0·56	0.14	1.52
3 lbs. Good meadow Hay	2·57	0·25	0·09	1·15
1 lb. Poor " "	0·86	0·08	0·016	0·24
7 lbs Barley Straw...	6·00	0·45	0·14	2·26
5 lbs Wheat Straw....	4·29	0·10	0·075	1·44
2 lbs. Wheat Chaff.....	1·71	0·09	0·03	0·64
50 lbs Roots.....	7·30	0·75	0·175	5·20
Total.....	26·06	2·28	0·666	12·56

For various reasons it is considered best in the case of these cows that the dry substance in the ration of each one should be about 28·5 pounds, and that the quantity can somewhat exceed that with profit; that the fat should not be less than 0·8 of a pound, and may without danger of waste be carried up to 0.95, and that the soluble nitrogenous substances, the starch, sugar and gum, should amount to from 12 to 13 pounds.

Our ration therefrom is deficient in every respect, except as regards the soluble non-nitrogenous substances. To make up for this deficiency, we may use our potatoes. But we learn from the tables of the composition of the foddering materials that, in order to supply 0·57 of a pound of nitrogenous substance, the quantity needed for a suitable ration, we would have to use 28·5 pounds daily for each animal; and we doubt whether it is best to do that, because our stock of potatoes would be insufficient, and we should still have to buy something more, and because, also, in adding 28·5 pounds of potatoes to each ration, we should carry the amount of dry substance up to 33 pounds and over, which would be altogether too much.

What else shall we do? On consulting the markets, we find that we can buy rye bran for 1½ thalers, or oil-cake at 1⅔ thalers per cwt., or rye itself at 1½ thalers per bushel of 84 pounds. The cheapest course would appear to be to get the rye; we ascertain from the tables that an addition of 3½ pounds of rye meal to each ration would bring the proportion of nitrogenous substances up to 2·66 pounds, or a little above the lowest limit that was considered consistent with judicious feeding. Let us see what will be the composition of the ration in other respects:

	Dry subst.	Nitrog. subst.	Fat	Non-nitrog. subst.
	26·06	2·28	0·67	12·47
3.5 lbs. Rye-meal.....	3·00	0·38	0·07	2·35
Total.....	29.03	2.66	0.74	14·82